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Vol. 22. 218 WILLIAM STREET, NEW YORK. No. 6

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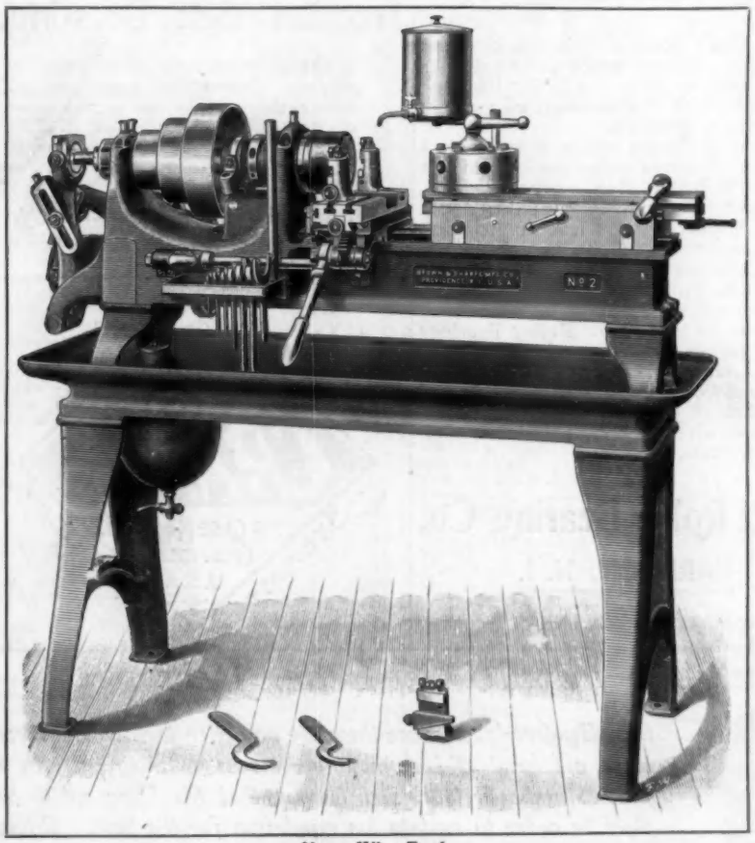

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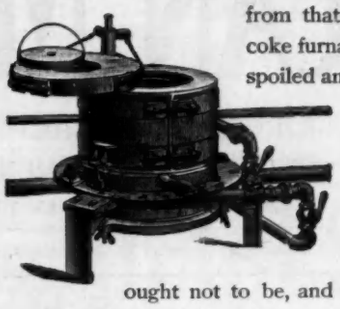

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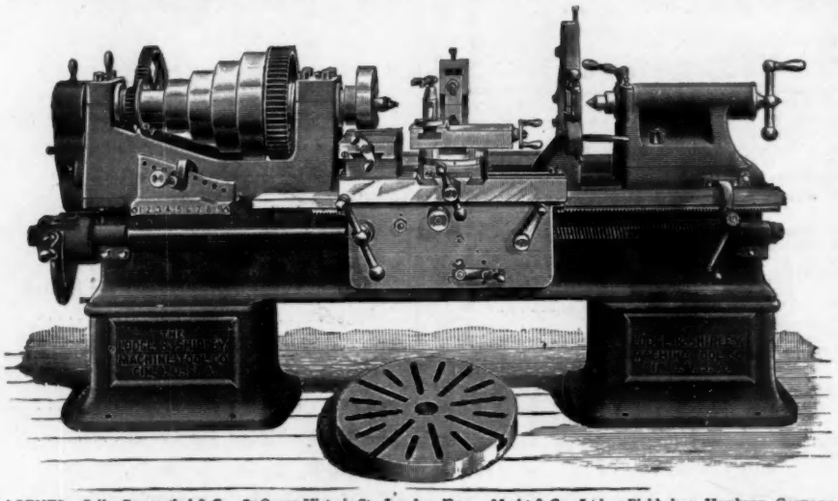

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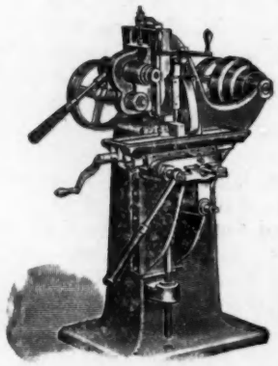

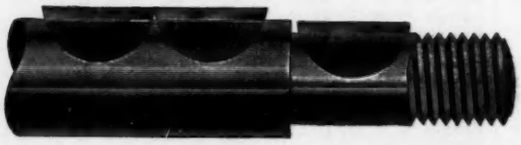

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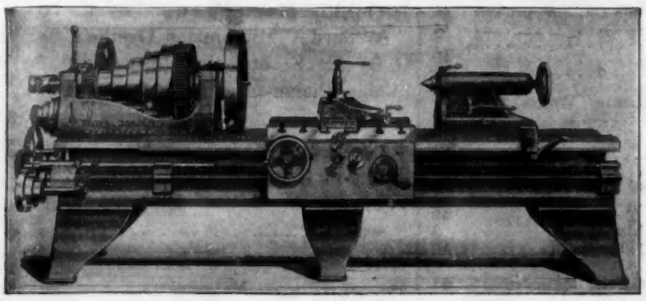

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AMERICAN MACHINIST

A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION

VOLUME 22 NEW YORK, THURSDAY, FEBRUARY 9, 1899 NUMBER 6

New Grinding Wheels and Machines

As our readers know, one of the departments of mechanical practice which has advanced rapidly within the last few years is the art of grinding. The latest, and what seems to us one of the most important developments in this line, is illustrated by the accompanying engravings, in which a new principle is applied with

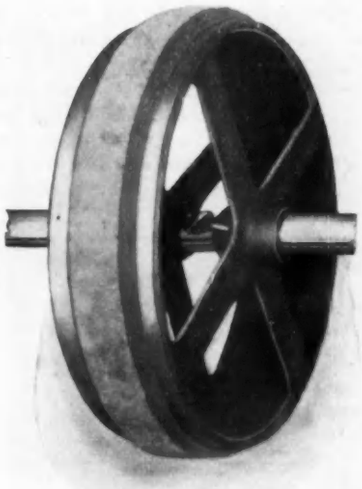


FIG. 1. FELT WHEEL.

the object of securing that element of elasticity or the quality of yielding in a grinding wheel which has been attempted in many ways before with varying degrees of success.

The inventor of the present system, Mr. Edward D. Woods, first tried, we

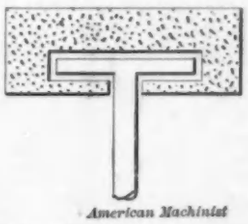


FIG. 4. SECTION OF LEATHER-RIM WHEEL.

understand, to make a satisfactory grinding wheel out of a bicycle wheel with a pneumatic tire. This not proving satisfactory he has invented and is now manufacturing at the works of the Woods Specialty Company, 15 Railroad Place, Newark, N. J., the various forms of wheels shown herewith, and also a line of grinding machines, some of which are also illustrated.

One form of grinding wheel is shown in Fig. 1 which consists of two wheels having rims on one side of the arms only,

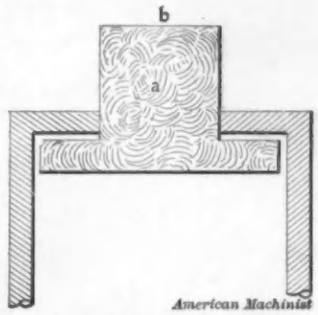


FIG. 2. SECTION OF FELT-RIM GRINDING WHEEL.

and carrying a wheel made of felt and having a section about as shown by *a*, Fig. 2. This wheel is charged with emery by the ordinary gluing process on the outer projecting surface *b*, and the flanges which go inside the pulley rims are as shown, somewhat smaller in diameter than the space in which they fit, so that when the wheel is standing still the felt ring is quite loose and can be moved laterally. When up to speed, however, the wheel runs true, and though it has

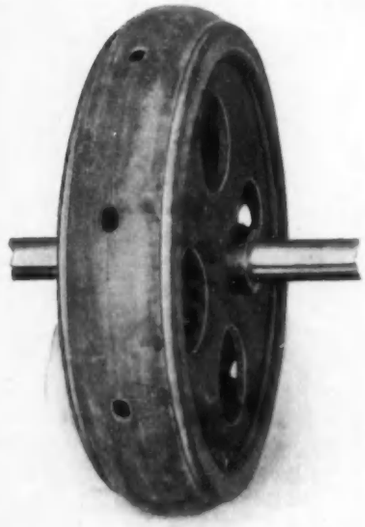


FIG. 5. ELASTIC GRINDING WHEEL.

no other means of driving than by the friction of the surfaces, no pressure seems to stop it and the centrifugal force makes it press hard against the object being ground and to grind with a steadiness and an efficiency well calculated to astonish him who sees the operation for the first time. There is absolutely no vibration or intermission in the grinding process; the surface is sufficiently yielding to insure that every grain of emery will do its share of the work, and the action resembles that of a solid wheel, which is absolutely true, except that a considerably

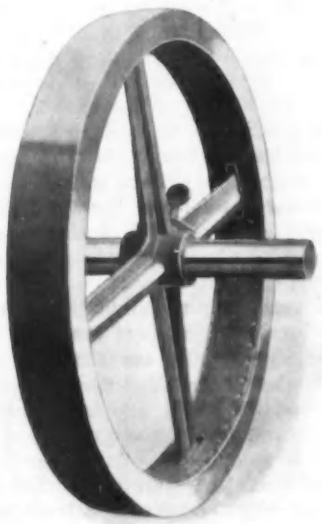


FIG. 3. LEATHER-COVERED ELASTIC WHEEL.

greater surface is ground owing to the yielding nature of the wheel.

In the form of wheel as shown in Fig 3 the grinding ring is built up of leather, and this is disposed about the wheel rim in the manner indicated in Fig. 4, so that the leather ring fits loosely and is centered only by the centrifugal force when running at high speed. This wheel is usually charged with emery on the sides also, and when desired it can be turned to any desired form on the face to fit the work to be ground. In this way round bars are ground lengthwise, or, any desired section can be ground.

The third form of wheel is shown in Fig. 5, wherein a heavy rubber band is attached rigidly to two spiders, one of which is rigidly attached to the spindle, while the other, though it is made to rotate with the spindle by means of a spline, is free to move endwise upon the spindle. When at rest this rubber band tends to separate the two spiders and to assume the form shown in the figure.

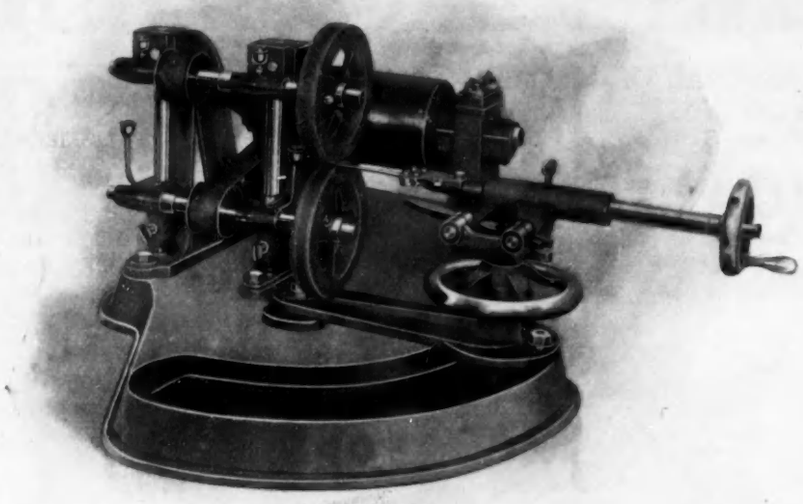


FIG. 6. BENCH GRINDING MACHINE.

When grinding is to be done a suitable ring of leather, having inward projections designed to engage with the holes shown in the rubber band, is placed loosely over it, and the wheel started in motion. Centrifugal force throws the rubber band outward, drawing the spiders together sufficiently to permit this enlargement until the rubber band fits the leather ring tightly, and thus again an elastic wheel is provided which yields to the work, yet exerts a steady pressure upon it and produces a grinding action which is absolutely continuous and surprisingly efficient. Owing to the fact that this wheel center adjusts itself to the diameter of the leather ring used, no great exactness is required in these diameters. They can vary considerably either by stretching or from any other cause, and of course can be applied or taken off with great facility; the ease with which these grinding rings are changed with this form of wheel being one of its particular advantages.

At Fig. 6 is shown a small bench machine, having mounted upon it two such wheels as are shown in Fig. 3. The spindles upon which these wheels are mounted are fixed one vertically above the other, and both are driven from a shaft at the rear. The lower spindle is adjustable vertically, and the practice in grinding thin objects is to adjust this lower spindle so that the wheels as they run just touch each other. The work is held in a special fixture, adjustable vertically by the hand wheel shown below. It can also be adjusted to any desired position and can be swiveled through an arc of 90 degrees in a horizontal plane, so that the work may be presented in line with the spindles or at right angles to them, as may be most advantageous, and passed between the wheels. By this means both sides of the work are ground at the same time, the yielding rims of the wheels permitting work to be passed between them without undue pressure and without choking down the machine, as would, of course, inevitably be the result if the wheels were solid; and the rapidity with which the grinding is done may be inferred from the fact that both wheels grind with absolute continuity, the surface produced by them being of very superior quality.

At Fig. 7 is a larger machine designed to use four wheels when desired, one on each end of each spindle. On this machine wheels such as are shown in Fig. 1 are mounted, and these are adjusted while running to touch each other, as in the case previously mentioned. This machine, as will be noticed, is fitted with feed rollers by means of which strips of metal of any desired form may be fed through the machine, much the same as boards through a planing mill, and as they pass through the wheels rapidly grind both sides of the strips, producing an excellent surface, and of course doing the work much more rapidly than has heretofore been possible. The lower spindle is in this case also ad-

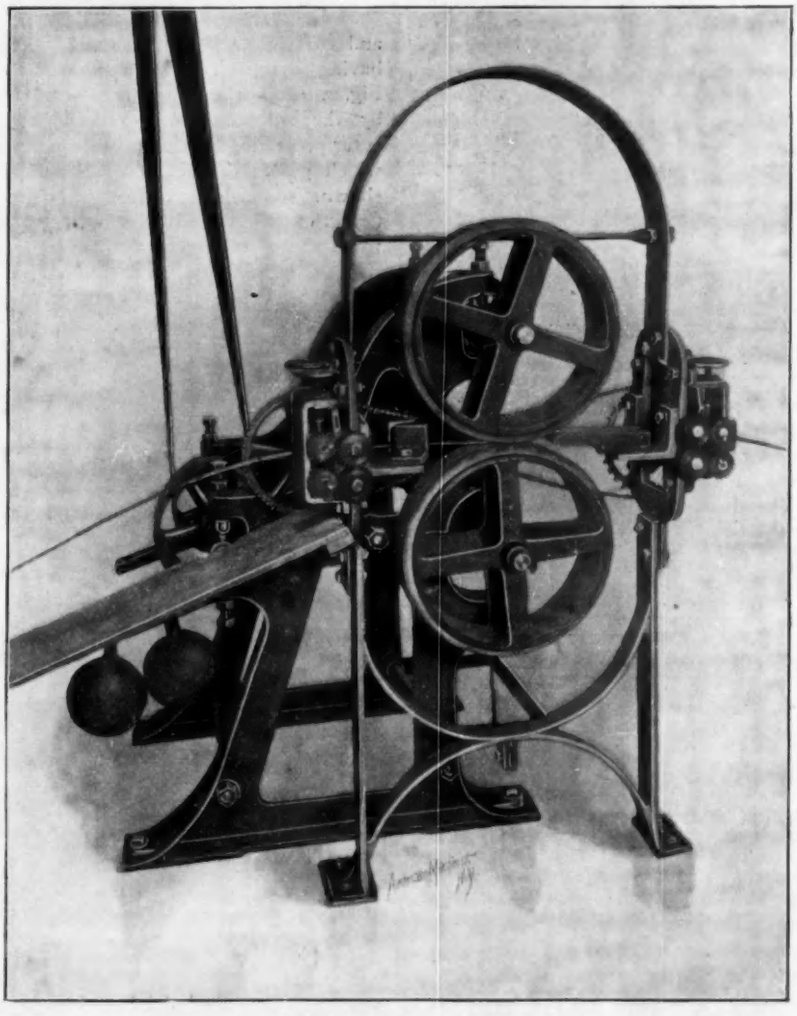


FIG. 7. GRINDING MACHINE ARRANGED WITH AUTOMATIC FEED FOR FINISHING STRIPS OR BARS OF METAL.

justable, and a weighted lever is provided by which a very considerable movement of this spindle can automatically take place in case by accident a wrench or any other tool may fall or be passed through between the wheels.

At Fig. 8 is shown another form of machine designed especially for cylindrical work, such as bicycle hubs, etc., and the fixtures shown grouped about this machine are designed, as in the case of the first named, to hold any piece desired to be operated upon, and to present it to the machine in the most advantageous manner. In this case such wheels as are shown in Fig. 1 are used and bicycle hubs, for instance, one of which is shown in position at the right, are finished and polished by it with very great rapidity, and with excellent results as to quality. As a test of the action of the machine, the writer saw Mr. Woods adjust these wheels so that they touched in running and he then passed a knife blade between them, the edge of the blade being first presented and the blade then passing through until the much thicker back was between the wheels. No jamming or catching took place, the grinding was continuous and satisfactory in every way, and the surface produced an excellent one. Such a machine as is shown in Fig. 8 is in the window of the Niles Tool Works store in New York, and is driven by an electric motor for exhibition purposes.

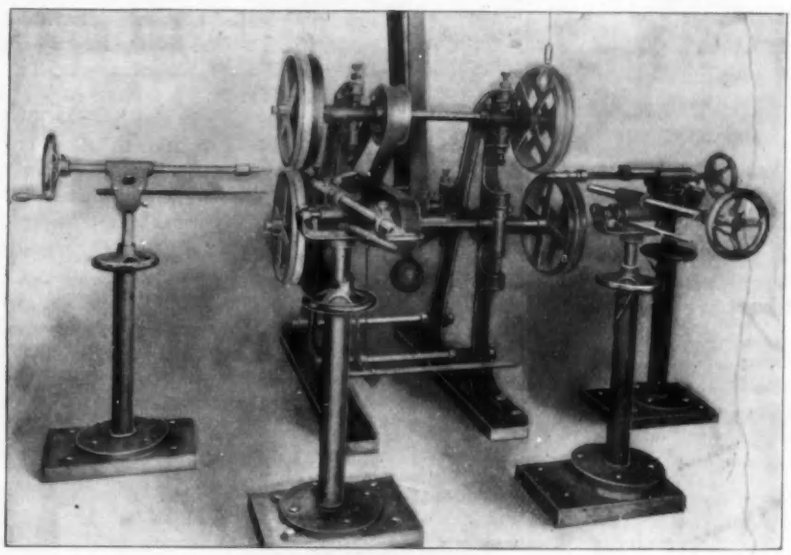


FIG. 8. GRINDING MACHINE FOR GENERAL FINISHING IN MANUFACTURING OPERATIONS.

Less Horses But Not Horseless.

The Municipal Council of Stuttgart, Bavaria, has passed a law forbidding the use of horses for trucks or the heavy freight wagons within the city limits.

This city, though only three of the long streets are of smooth, level pavement, is far ahead of other Continental towns in automobile vehicles for both passengers and freight. It really has no need of horses, and as the horses are in the way of the rapid locomotion of the automobiles, the city has taken the matter in hand and decided that the time has come for the horse to go.

Despite the numerous hills and unpaved roads, the automobile freight wagons and carts have proven a great success. Even the Bavarian farmers are taking a deep interest in the matter, and the newspapers predict that the time is not far off when horses will be principally of use for pleasure drives.—"L. A. W. Bulletin."

Burning Low-Priced Fuel.

BY W. H. WAKEMAN.

Our attention has been called many times to the fact that in the coal regions of Pennsylvania there are vast mounds of coal dust that have been accumulating for years, and as this is at present a waste product, it can be bought for a very low price per ton, taking it as it runs, and where it lies. Special forms of grates have been devised to burn this fuel, with blowers of various kinds to produce a blast strong enough to force the air through it and maintain combustion, but still the piles of coal dust continue to grow while good coal, or, in other words, coal of larger size, is used for making steam. What is the cause of this apparent inconsistency on the part of steam users? This question is one that is asked many times, but it seldom receives a satisfactory answer, and while I may not give all of the reasons why the fine coal is not more extensively used, still I intend to point out some of the objections to its use.

A ton of coal dust that is produced by the process of loading and unloading stove and lump coal, thus knocking the pieces together and breaking off minute particles which form the dust, is capable of developing as many heat units as a ton of the larger size, but it cannot be burned successfully without a shaking grate of approved form, and while there are several kinds on the market, I think there are not more than two that can be called perfect for this purpose, and so far as I am informed, the makers are not giving them away. Therefore, the cost of fitting up furnaces for this fuel is rather high, and this prevents many from making the change. But a ton of dust produced in the way just mentioned is far superior to a ton of dust taken from some parts of the great piles near the mines, for, when these were thrown up the material was considered wholly a waste product, so that no effort was made to keep the slate dust and the good coal dust separate. Therefore, many tons are found that will not burn at all.

It is usually conceded that when coal has been exposed to the weather for many months it loses much of its value as fuel, and, as these piles have been so exposed, it is only reasonable to conclude that a large part of them are no longer in their prime. Of course it could be sorted over, the good taken and the poor left, but this would be rather expensive, hence impracticable; and also it is possible to burn it with common grates, but clinkers form very fast, and they cause the fireman much more work than larger coal does, thus increasing the wages in the fireroom, and when cleaning such a fire with stationary grates there is danger of losing the fire altogether.

Another important reason for not using this fuel more extensively is that it costs just as much to transport a ton of dust from the mines to the consumer's boiler-house as it does a ton of larger coal, so that the difference in the price of the two is not great enough to make it an object, especially where pea coal is now used, and if the fine coal or dust was to be used to the exclusion of other kinds in many of our large mills and powerhouses, the mine operators would raise the price until the difference between the larger and the smaller sizes would disappear.

Another point to be taken into consideration is the fact that coal dust will absorb more water than larger coal, and, as a rule, the local coal dealer does not consider it worth while to keep his sheds in first-class repair, while there are none over the piles at the mines, and as a natural consequence the consumer buys water and coal together instead of purchasing them of different parties, according to the more approved custom.

These objections to the general use of coal dust for making steam stand like lions in the path of the steam user, and they are not chained so as to be harmless either; hence, until they are removed, but little progress can be made along this line.

A Design for a Small Welding Transformer.—II.

BY GEORGE T. HANCHETT.

It is now necessary to provide an iron enclosure for these coils, and this is made of strips of sheet iron. This iron should be very soft, and when ordering it, the purpose for which it is to be used should be specified, for manufacturers make special qualities of iron for this purpose. It

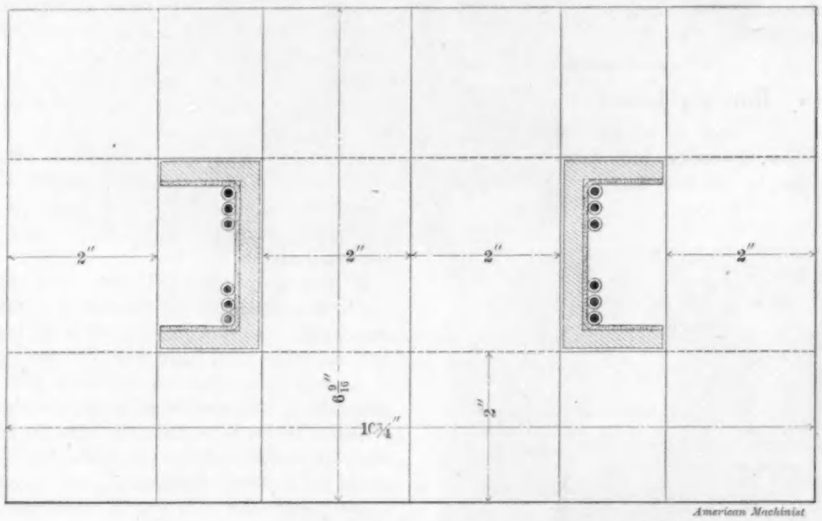


FIG. 7. ARRANGEMENT OF LAMINAE ABOUT THE COILS.

can be bought in strips 2 inches wide, and may be cut to the proper lengths with an ordinary pair of tinner's snips. These strips are of two lengths, one set being 10¾ inches long and the other set 6 1-16 inches long. They are to be stacked about the two sides of the secondary casting *G G* in the manner shown in Fig. 7. They should be 20 mils thick, and there will be needed about 250 long pieces and double that number of short ones.

It is evident that the strips of iron will not retain this position unless they are clamped in some way, and to provide for this, and further to provide a support for the transformer, two castings such as are shown in Fig. 8 are made. These castings are alike, and one pattern will answer for both. The castings are placed about the coils at either end of the pile of assembled strips, and are tightly set up by long bolts connecting the various bolt holes which are opposite. Care must be taken to protect the secondary from short circuit by the iron strips on the end castings, and for this purpose it will be well to make the end strips of thin fiber, say 1-32 inch thick, and to insulate with tape all points of possible contact between iron and copper. The construction will be better understood by a glance at the assembly drawing, Fig. 9. On the lower side of these castings are provided two legs, and thus the transformer is supported upon four points which may be bolted to the work bench. It is advisable to do this, so as to hold the terminals perfectly steady when handling heavy or difficult parts.

The copper castings for this transformer will weigh about 28 pounds, and there will be needed 11 pounds of No. 6 wire for the primary and about 130 pounds of transformer iron, to which must be added a certain percentage for waste, according to the shape in which it comes. Very excellent transformers have been made from hoop iron such as is used in binding bales, and as that material comes in strips, there is little or no waste. The copper castings for the terminals will weigh, approximately, 12 pounds in case of screw terminals, and 10 pounds in case of terminals using swinging arms.

The cost of this material will vary with the market price and also with the locality, for some foundries charge more than others. Roughly, it may be said that the No. 6 wire may be had for 20 cents per pound; the copper castings will cost 26 cents per pound, the iron castings about 5 cents per pound, and the sheet iron 5 cents per pound, thus making the total cost of materials something less than $18.

The transformer is now complete and a few words concerning its use may be advisable, though it is to be remarked that a few preliminary experiments will do much more to render the operator expert. A means should be provided for controlling the current, and this is accomplished by inserting into the primary circuit an adjustable resistance. This resistance must be able to carry 20 amperes, and there are many arrangements which will answer. A rheostat, such as is commonly used to start motors, will be found to be very satisfactory, and in default of something better, a water rheostat may be constructed. The details for a suitable water resistance for this purpose are shown in Fig. 11. A common water pail is provided, and in the bottom is fitted a circular sheet of lead, to which is connected a rubber-covered copper wire leading out of the pail, as shown. A second piece of lead, preferably a circular casting, and of the section shown in the figure, is made and is hung from a cord passing over a pulley. To this casting is attached a second wire, and these two wires are connected into the primary circuit of the transformer. The pail is filled with water and a few teaspoonfuls of strong sulphuric acid are added, and when the solution has been thoroughly mingled it will be found that lowering or raising the leaden weight by means of the cord will vary the resistance of the

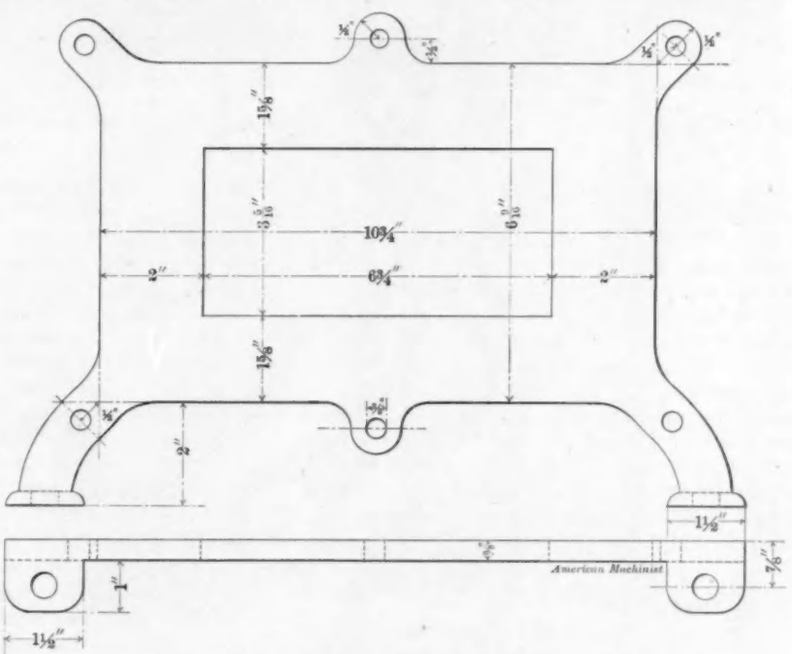


FIG. 8. DETAILS OF END PLATE.

apparatus through a wide range. The cord may pass over pulleys to a small windlass, the handle of which is conveniently placed near the operator. Thus connected it will be found that by properly

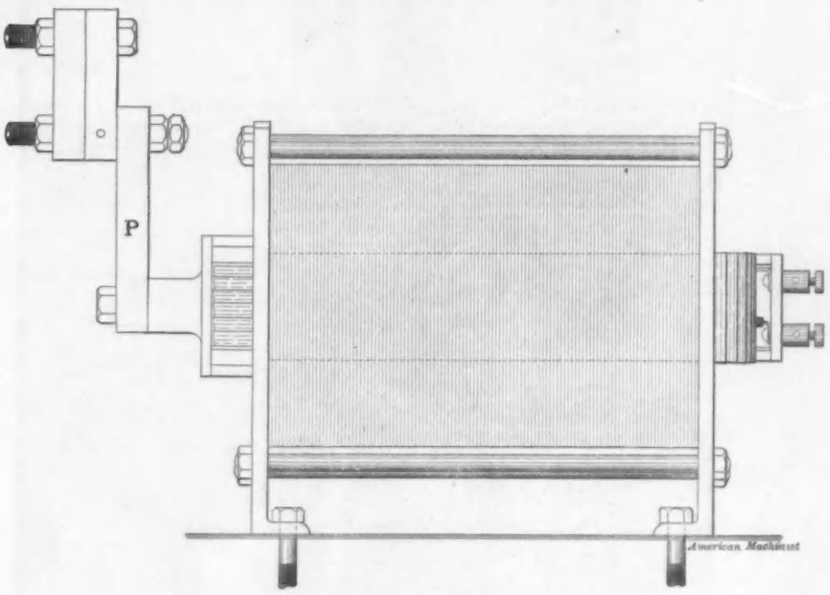


FIG. 9. SIDE ELEVATION OF COMPLETE TRANSFORMER.

manipulating the crank of the little windlass, the secondary current can be widely varied at will.

To weld two pieces of metal together they are securely clamped in the jaws of the welding machine and placed in

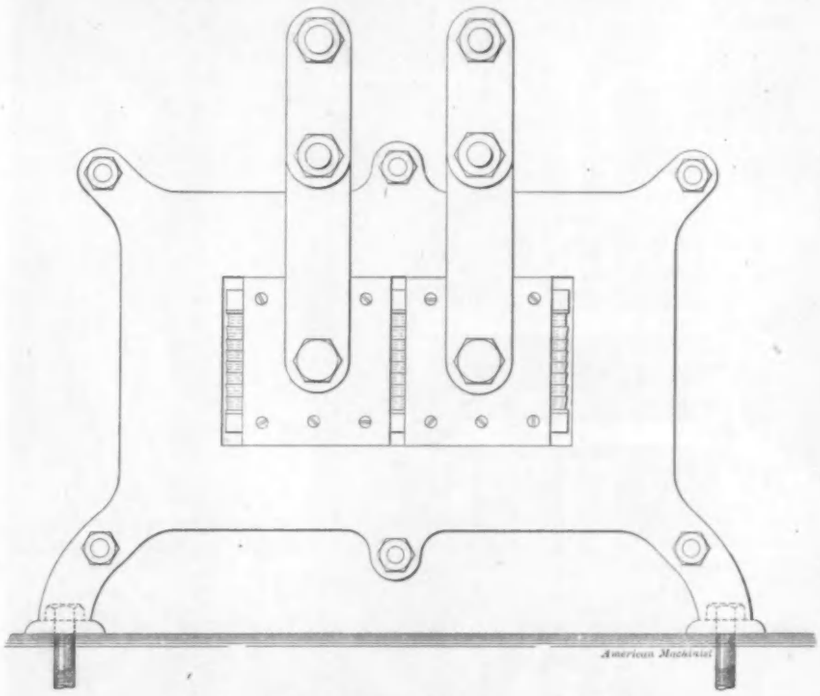


FIG. 10. END ELEVATION OF COMPLETE TRANSFORMER.

contact. The contact at first is somewhat poor, and as large currents are passing, great heat is concentrated at this point and welding temperature is rapidly approached. When this is very nearly reached the joint is suitably fluxed, pressed firmly together, the current being increased as the contact of the joint becomes better. Presently the joint will have conductivity equal to the rest of the work which will then begin to heat, and the joint itself will become cooler. The current should then be cut off and the work is done.

In brazing, two pieces to be joined are clamped in the jaws of the machine, smeared with the proper flux and placed in contact. Brass filings are applied to the joint just before brazing heat is reached. It will be found best, in cases where it is possible, to cover the work with charcoal while the brazing is going on, for the oxidizing effect of the air is prejudicial to the process.

For drawing the colors on a finished tool, even distribution of heat is desired, and for that purpose the contact should be equally good at both ends. Reamers and taps should be held by pressing the jaws against their ends without the use of the clamps. Square dies should be similarly held. In tempering any tool the aim should be to find a path of uniform resistance through the part to be tempered and make equally good contact at either end thereof.

To attempt to describe just how to use the apparatus in all of its various offices would be like attempting to instruct a man how to file a flat surface. A few hints can be given, but the actual operation can be performed only after the aspirant has had practical experience.

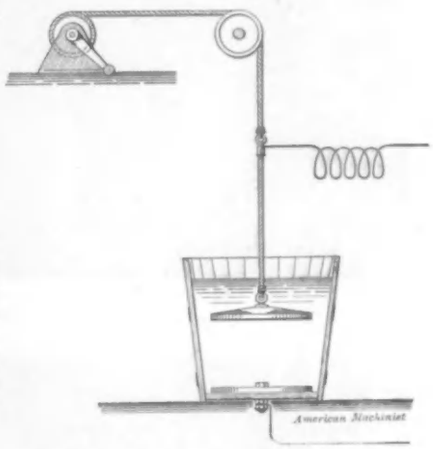


FIG. 11. WATER RHEOSTAT FOR CONTROLLING PRIMARY CURRENT.

As this description may fall into the hands of non-electrical men who desire to make the apparatus, it is well to add that in connecting primary terminals to the main circuit, the following precautions must be taken. If the system to which the transformer is to be connected is a 104-volt system, an inside and an outside end of the primary should be connected together by a wire crossing the mount upon which the primary binding posts are placed, diagonally. The free ends may now be connected directly to the mains, or with the water rheostat interposed in one of the leading-in wires.

If the system is a 52-volt system, both of the inside ends of the primary should be connected together and also both of the outside ends, and the pairs thus united should be connected to the wires of the main circuit as before. A convenient way is to strip about 2 inches of insulation from the ends of the leading-in wires and pass them through two binding posts which lie in a line parallel to the primary wire.

If the transformer is to become a regular adjunct in a machine shop, it should

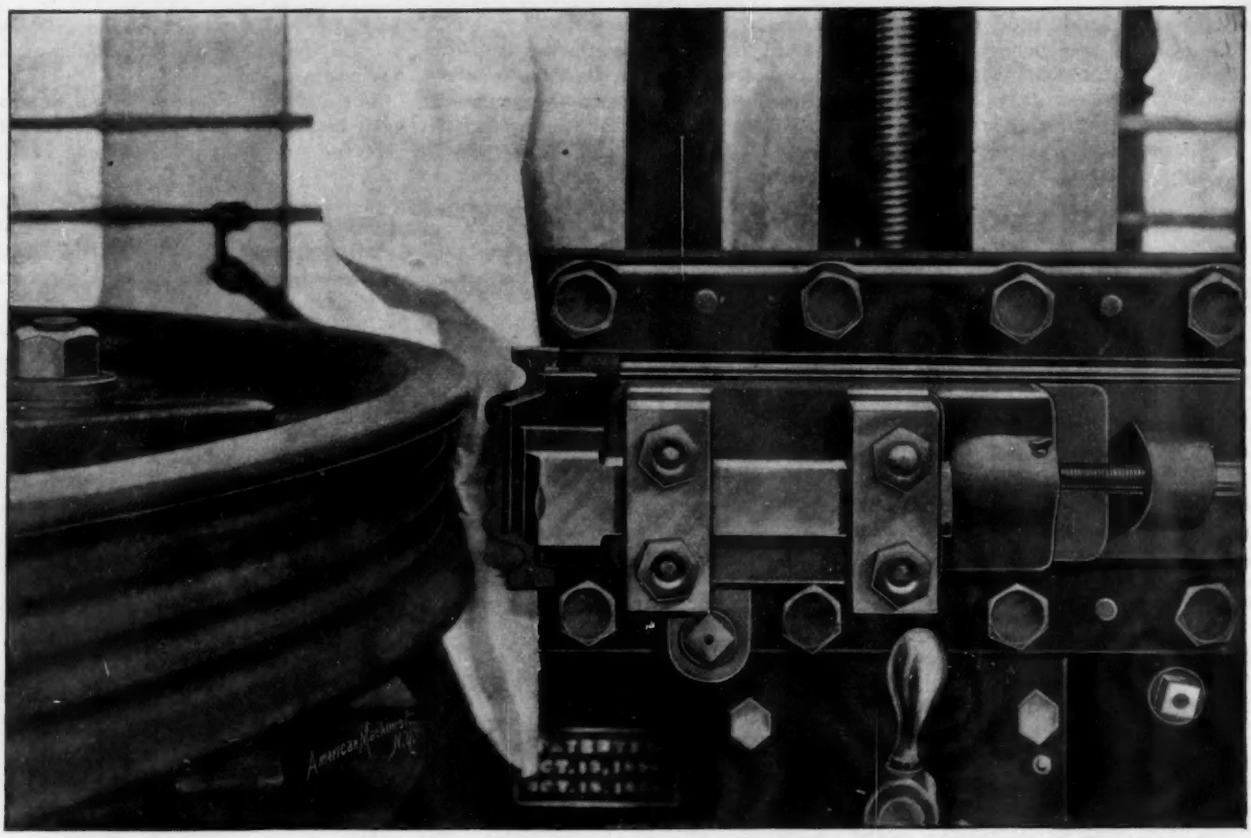


FIG. 2. SHAPE TOOL IN PLACE ON BORING MILL.

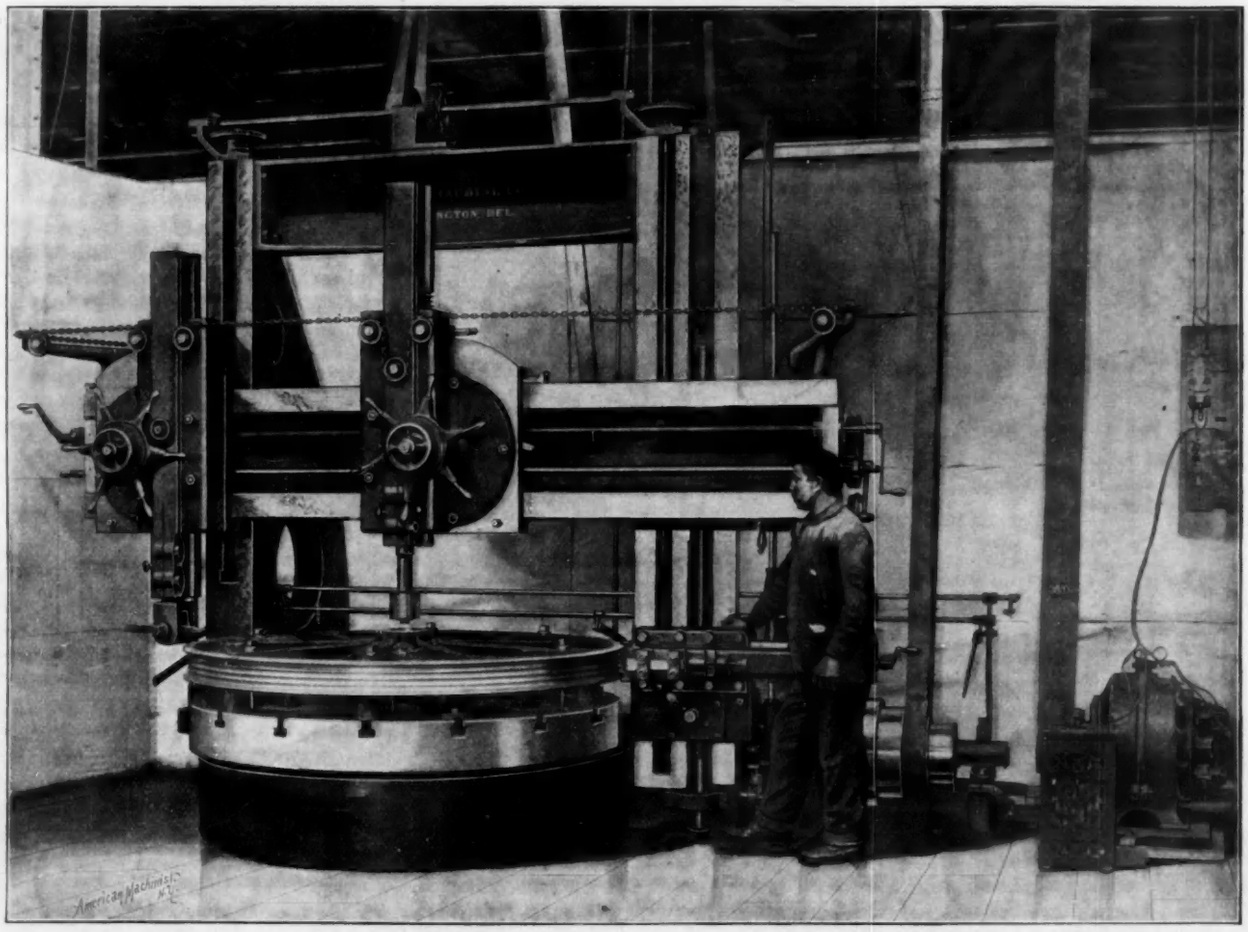
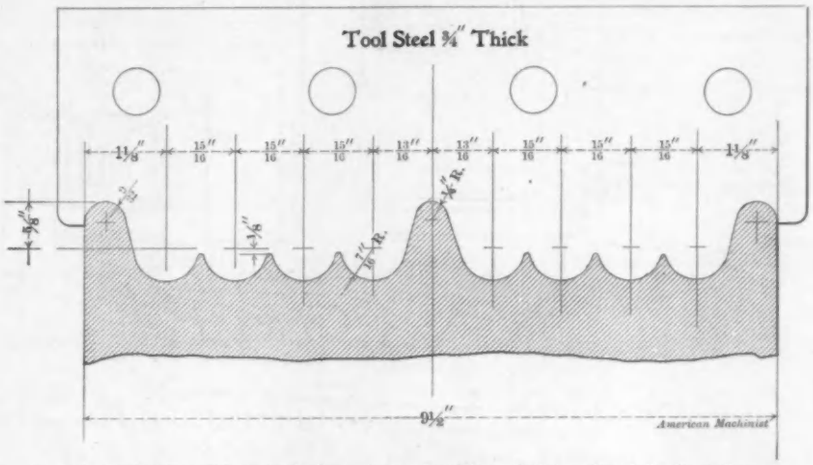


FIG. 1. WORM DRIVEN BORING MILL WITH EXTRA SIDE HEAD.

be wired up with proper fuses and switch once and for all in a permanent manner. To determine whether the frequency is of the proper value, the local electric company supplying the current may be consulted.



Length of Cutting Edge, 15 inches, Approximately. Cutting Speed in Cast Iron, 34 Feet per Minute.

FIG. 3. ROPE SHEAVE FINISHING TOOL.

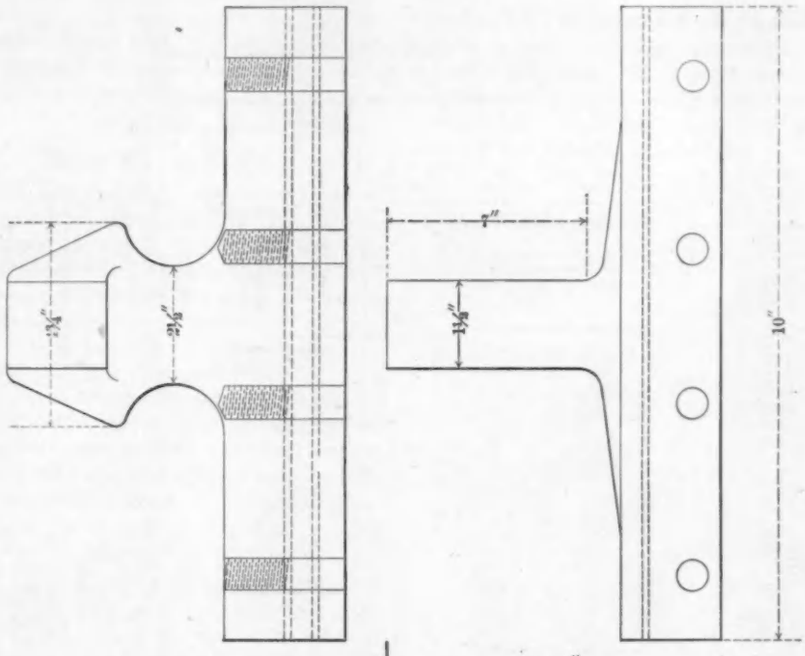


FIG. 4. SHAPE TOOL HOLDER.

This transformer is designed for 16,000 alternations per minute, or 8,000 cycles per minute, which is the most common commercial frequency in small installations. It is also well to state that this transformer will operate perfectly well on voltages and frequencies slightly differing from those for which it is specified. For instance, 110 volts will answer as well as 104, also 55 as well as 52, and similarly good operation may be had from currents of 120 cycles per second instead of 133. As standard frequencies and voltages vary in different localties, this information may be useful.

Unusual Profile Turning on a Boring Mill.

It is probable that in no direction is greater progress in machine-shop practice being made at the present time than in the systematic taking of heavy cuts. The demand for the maximum output of which machine tools are capable is universal, and is leading to modifications of the tools to stand heavier and heavier cuts.

Through the courtesy of the Sprague Electric Company, the users, and the Betts Machine Company, the builders, we are enabled to place before our readers the accompanying illustrations of a boring mill containing some unusual features and particulars of an unusual job done on it.

The job in question is the shaping of rope elevator sheaves, one of which will be seen in place on the mill in the general view, Fig. 1, while a closer view showing the tool used is given in Fig. 2. The sheave will be seen to have four grooves, for as many ropes, and a wide flange at each edge, and the special point of interest is the fact that the entire profile of the sheave is finished with scraping out by a profile tool, which can be seen in both the figures. The mill will be seen to have an extra side head on the upright nearest the operator, in addition to two heads on the cross-rail, and all three heads will be seen to be brought into action in the making of the sheave. The farther one carries a roughing tool by which the scale is taken off and the grooves are started, while the one in the middle of the rail carries the tools for boring the hub hole. The side head carries the shape tool for finishing the sheave to the proper profile. A detail of the finishing tool, including its dimensions, will be seen in Fig. 3. The holder for the tool is shown in Fig. 4. As will be seen in the plan, the tool holder is so shaped as to give the tool a drag or spring away from the cut. This was found to be essential to the successful operation of the tool, the first holder without this feature having been a failure.

Inasmuch as this cut is a remarkable one, and as it is probable that the worm drive of the boring mill table has much to do with the success of the operation, we give in Figs. 5, 6 and 7 some views of the operating mechanism of the mill, made from a working drawing.

The central spindle of the mill table will be seen to have no step, the step function being performed under all kinds of service by the circular track near the outer edge of the table. The function of the spindle is purely that of a bearing to prevent displacement, and not to take the end thrust. The surface of the spindle is cylindrical, and it will be seen to be fitted to a long sleeve, tapered upon its outer surface and split longitudinally in one place. A flange at the top with suitable bolts serves to adjust the bush to take up wear, and a plate at the lower end of the spindle prevents tilting of the table under heavy cuts on high work. The upper end of the spindle will be seen to be bushed with a hardened steel bush in order to guide a boring bar which may obviously pass right through the machine to any depth below. This feature by which a long boring bar may be used has led to a novel method of feeding such bars. Fig. 8 is a detail of

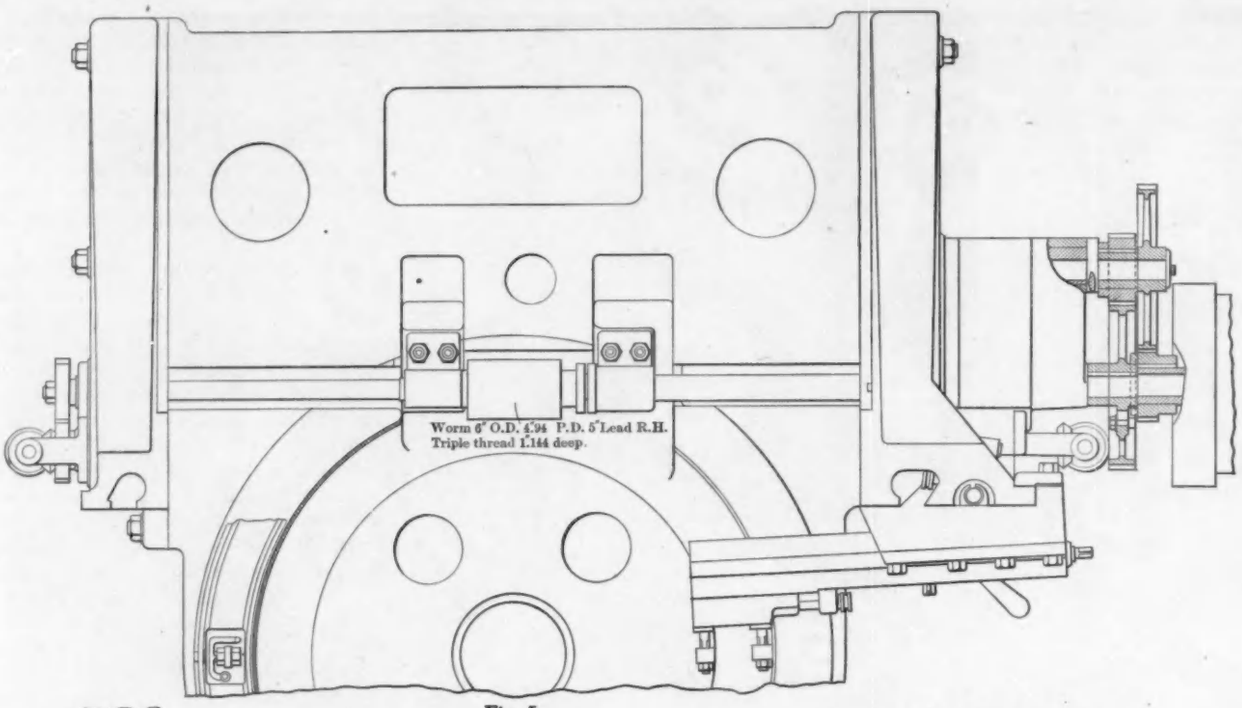


Fig. 5.
Plan of Worm Drive

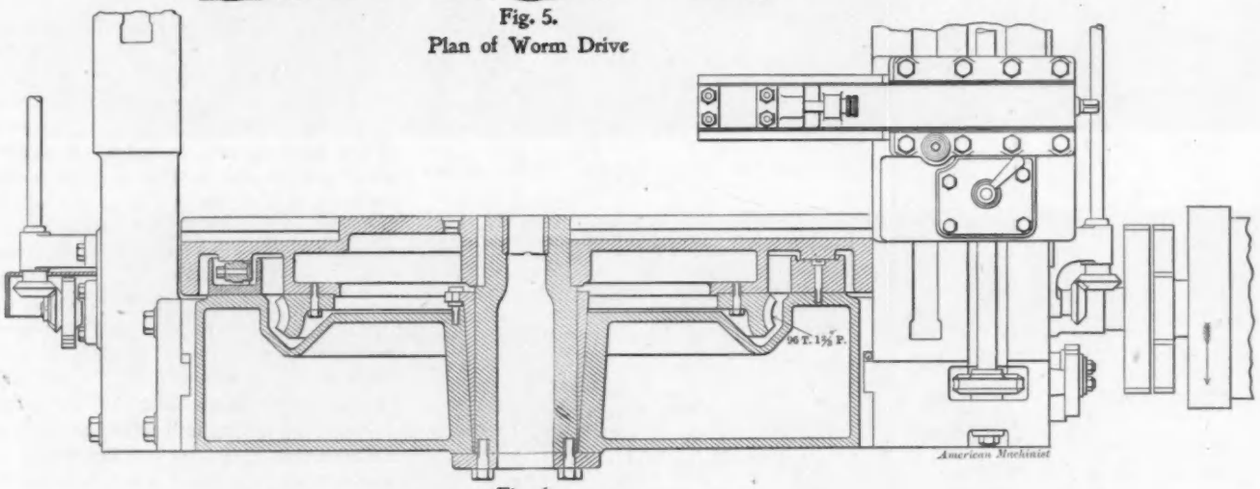


Fig. 6.
SECTION OF TABLE AND BED.

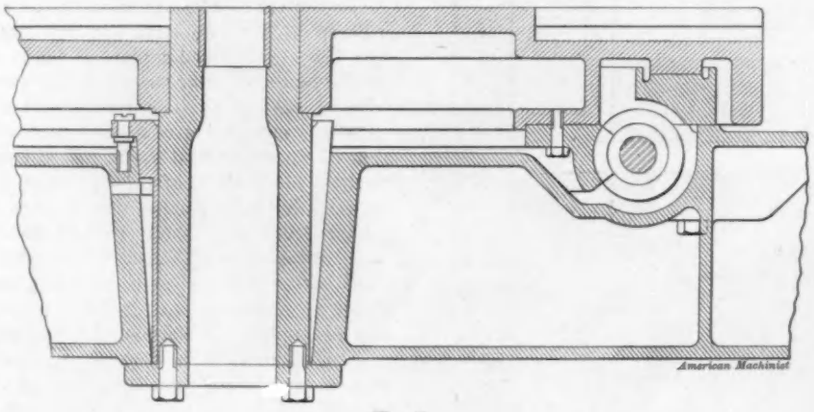


Fig. 7.
ARRANGEMENT OF WORM.

the tool bars in the cross-rail heads. The bars will be seen to be accurately bored their entire length and to be split and provided with binding bolts at the lower end. For ordinary work these binding bolts grip the usual tool holders, but when a boring bar is to be used, it is passed through the tool bar and entered into the bush in the machine table. The pinch bolts of the tool bar being tightened, the boring bar may be fed by the ordinary tool feed, and when, as with long holes, the tool has been run out the length of the feed, the pinch bolts may be loosened, the feed run back, and a new hold on the boring bar taken, so that holes may be bored up to the full length of the highest piece the machine will take in. The side head will be seen to be provided with two slides and two screws. The purpose of these is to facilitate the making of winding drums for elevator ropes, the grooves for which must obviously be cut like screw threads. The short outer slide is provided for the adjustment of the tool between cuts; the long slide being brought to the same position at each cut.

The most striking feature of the mill, however, is the worm drive of the table, which is seen in both plan and cross-section, Figs. 5, 6 and 7. The worm is of the

steep pitch type, a full account of whose remarkable properties was given in our columns early last year.

Figuring back from the pitch diameter and lead of the worm thread, the pitch angle of the worm at the pitch line is found to be 17° 50′, which reference to our article on "Modern Practice with Worm Gearing," of January 20 last, shows to be in the region of high efficiency worms, and the satisfactory performance of the drive is not a matter of surprise.

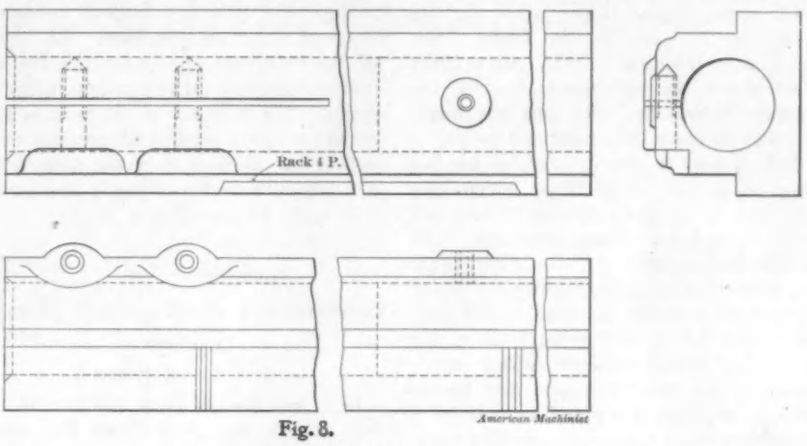


Fig. 8.
DETAIL OF TOOL BARS.

Brass Worker's Lathe.

The accompanying illustration is of an English brass finisher's lathe, most of the features of which will readily explain themselves, the unusual one being the means provided for increasing the speed when desired, for withdrawing the tap or die, no shifting of belts being required for this purpose.

As will be noticed there is a spindle placed below the main spindle and driven by a two-speed pulley. The other end of this spindle carries a friction roller which engages with a groove in a friction disk. and the inner end of this shaft can be elevated or depressed to engage this friction roller and thus give the motion for threading with rapid backing motion. By raising the lever the roller engages with the outer groove and gives a slow speed for tapping, and depressing the lever engages the rollers with the inner groove and gives a more rapid backing speed. In its normal position the roller is disengaged and is out of action. The cone pulley is for a 3-inch belt with its largest step 11 inches, and the spindle has a hole through it 2 inches in diameter. It runs in gun metal bearings, and there are ball collars to take up end thrust. The turret is 8 inches in diameter, has six holes and is mounted on compound and swiveled slides with adjustable stops in each direction. A brake is provided which acts on the rim of the friction disk, and this is operated by the foot lever seen below the machine, which is made by Webster & Bennett, Coventry, England.

The Keely Motor Explained.

For more than a quarter of a century that mysterious outfit, known as the Keely motor, has baffled investigation, provoked criticism, aroused suspicion, defied philosophy and troubled stockholders.

Fortunately, however, the "L. A. W. Bulletin," with its usual philanthropy, comes to the rescue with a technical description which may be easily understood by everybody. Many will wonder how we came by this valuable information.

Well, we have read much that Mr. Keely, himself, had written on the subject, and since the great inventor's death, and his devices were shipped to Boston, we have talked considerably with a man who is acquainted with the gentleman who owns the house across the street from where the motor is now located. We have also talked with a brakeman who saw the arrangement taken out of the freight car on its arrival at the "Hub," and to have this "scoop" complete, and make assurance doubly sure, we interviewed the teamster who did the hauling.

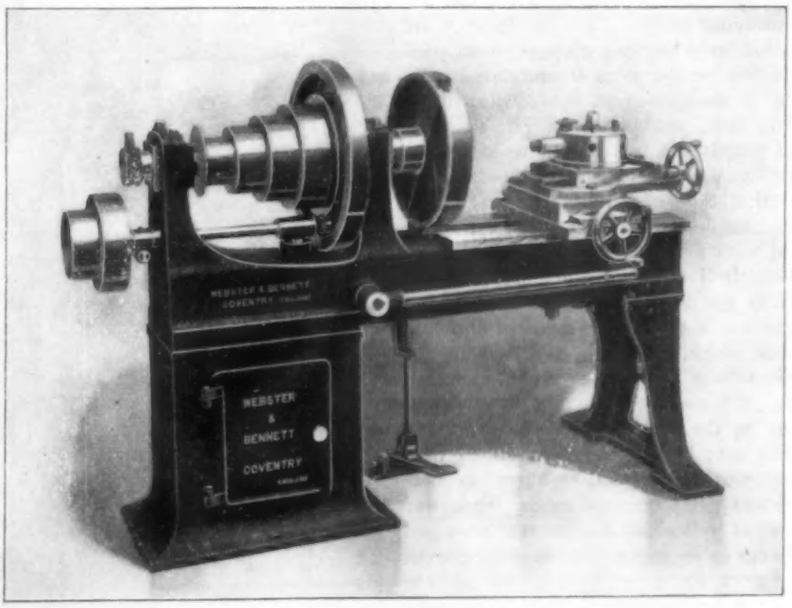
The main generator consists of a plano convex parallelogram, made of phosphor bronze and strongly reinforced with low-moor open-hearth steel.

A molecular oscillation is transmitted from the generator to the sympathetic diaphragm, by means of a negative attraction due to the inter-etheric force, which is discovered to exist between the neutral center of the earth and the magnetic depolar mass of iron that was located under the floor of the factory.

When Mr. Keely, as was his custom, drew a fiddle-bow across the edge of the magnesium, vibratory, truncated, lignum-vitæ disk, which had its decarbonized. albuminoid magnetic center connected by means of a gutta-percha ligament, with the fundamental imperialistic diagraph of the Wall street sinews of war, it caused a responsive thrust into the pocket of the spectator, which resulted, usually, in depolarizing the flexor carpi radialis and causing the digits to relax to such an extent as to be decidedly advantageous to Mr. Keely.

To the inventor of this wonderful motor is attributed the discovery that the air which wafts on its balmy bosom the odor of the glue factory into our ever-willing nostrils, is not solid as it seems, but is full of little holes, which, to the ordinary eye, are invisible, but in which Mr. Keely discovered wonderful possibilities.

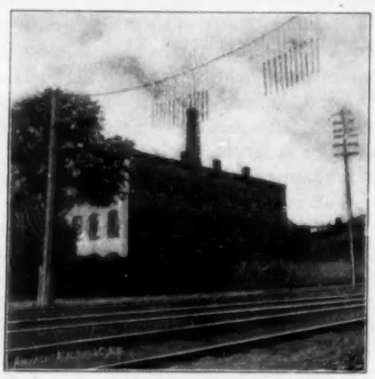
He found that this inter-atomic ether, although as calm and peaceful as a summer evening, when let alone and left to mind its own business, would tear around



A BRASS FINISHERS' LATHE.

and act just simply awful when a little of it found itself shut up in one of his bronze generators, especially if some of the stockholders happened to be looking on, and that this terrific development of force could be stirred up and set going by the vibration of a tuning-fork, it being only necessary to have the size of the intermolecular atoms of ether to correspond with the tone of the synchronous symptoms of the vibratory induction of the sympathetic flow of the stock market.

Mr. Kinraid promises to tell us within a year whether the above is correct. Meanwhile we go on with our regular business.—"L. A. W. Bulletin."



"Busted."

BY F. W. BRADY, M. E.

A little sermon can be preached over the remains of the shop shown in the accompanying photo. Just the location of this formerly hustling place is of no concern, nor would it, in its present condition, be recognized by those who, in its palmy days, worked there. For all practical purposes it is sufficient to state that once (and not so long ago) this building was the scene of activity; its walls surrounding first-class machinery; its floors filled with first-class workmen.

Exactly like lots of other places, it began to go down; sinking, through no cause but a temporary dullness and low prices which, although the recovery of business was probable at a certain future date, the management met by slashing away at the salary list, forcing the old hands out; their places being filled with cheap workers. Then, to hurry up matters and get money in quick, work was taken at ridiculous prices, and promised delivery in an impossibly short time, even to "botch it up." Toward the end, to save themselves, still cheaper hands were put on the work, carrying the standard of the finished work still lower. Just at that time a Mr. —— started a shop in the next town, causing the community to stand aghast at his nerve. He collected a few men, those who worked for and were put out of the shop we are considering. When the machinery from the cheap shop was "finished," and was so unsatisfactory that it was useless to attempt to use it, Mr. —— played his cards cleverly, and got the job of rebuilding a lot of the stuff, doing it by hour work.

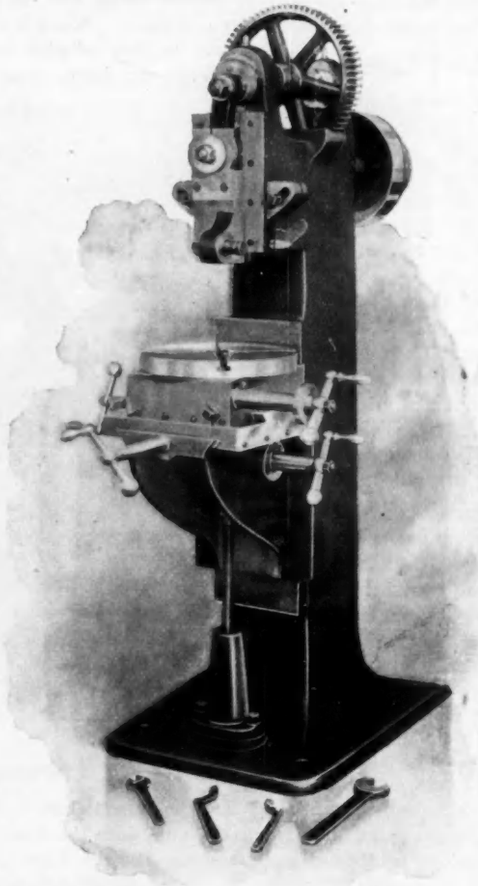
All hands but Mr. —— suffered financially; our big shop lost money on the work. The customers spent more than the work would cost, done right the first time, not counting the expense of delay.

On some of the larger work the big shop cast its name on the frame. Mr. ——, after thinking a little, put a brass plate above the cast name, bearing the legend, "Rebuilt by," etc. This was rough, but was no more than right and proper.

Before long it was decided, in the big shop, to go out of business, which they did; and the cut gives an idea of the small boys' respect for vacant buildings. The trouble is, now, that Mr. ——'s shop, having grown considerably in size, he seems to have an idea that his head should keep pace with it. If this prove fatal to the enterprise, it will, however, afford an opportunity for some new man who knows how to do good work and to manage a business without acquiring a swelled head.

Die Makers' Slotting Machine.

We illustrate herewith a small slotting machine which is designed especially for die-making operations, and with that object in view, it will be noticed that the slide can be adjusted within certain small limits to give any desired clearance angle in the die, graduations being provided for this.



SLOTTING MACHINE FOR DIE MAKERS.

The knee is adjustable vertically by the lower crank handle at the right, while the various slides are operated by the others, the upper right-hand crank handle being for the rotary motion of the table. The table is also provided with index notches by which definite positions such as those required for planing squares, hexagons, octagons, etc., are obtained; the crank handle being arranged also for the use of index dials for other divisions when required. The diameter of the table is 12¾ inches; it has a vertical adjustment of 15 inches; the movement of the table slides is 7 inches, and the stroke is 2½ inches. It is made by the Garvin Machine Company, New York.

Combination Drilling and Planing Fixture.

BY D. E. MAC CARTHY.

It is not always good practice to use one fixture for performing too many operations on a piece of work, but there are cases where one tool can advantageously be made to cover a wide range of work. To illustrate a case of the sort, I show by the accompanying sketches, a jig designed to do nearly all the finishing required on the iron casting shown in Figs. 1 and 2, its length over all being 13½ inches, with a 2-inch reamed hole through the hubs, and the largest radius

to be 6 inches, which was found too great to swing in our milling machine.

There being but seventy-five castings to finish, it was decided that we should economize so far as possible in the work of making special tools for the job.

The operation of boring the 2-inch holes and facing the hubs was done in a horizontal boring and drilling machine, and the tapped holes in the hubs were drilled in line with the center, as shown at *c*, and are for screwing in oil cups; hole *a a* being a journal bearing for a revolving shaft. All other operations on the casting were finished in the fixture, two views of which are given in Figs. 3 and 4. The sides *A B* (Fig. 1) form a right angle. Side edges *C D*, slots *E* and F, and bottom *G* are all to be planed true with the center hole *a a*; the right angle *A B* to be accurate, and slots *E F* to be parallel with sides *C D*; holes to be drilled at *a b* and *c d*, *e f g* and *h i j*, and in one of the ends at *k l m n*.

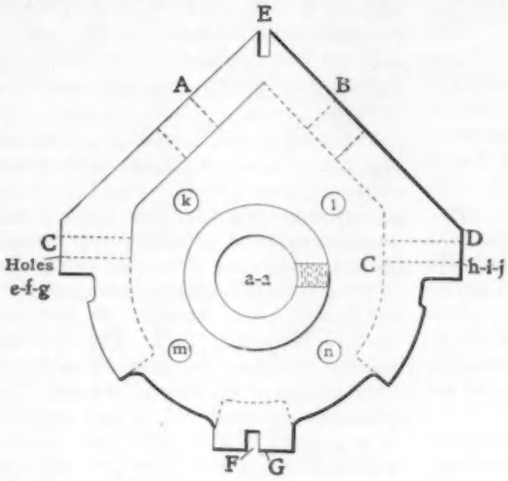


Fig. 1

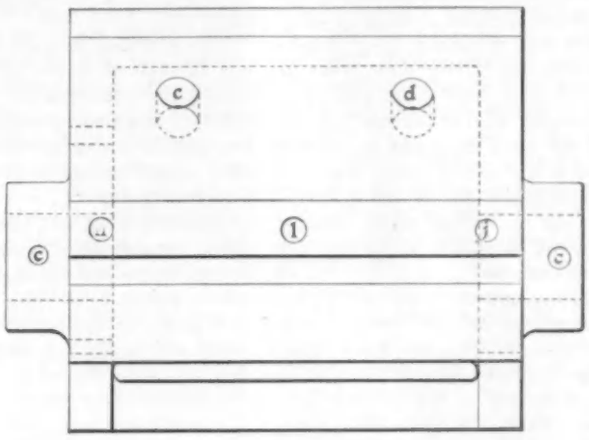


Fig. 2

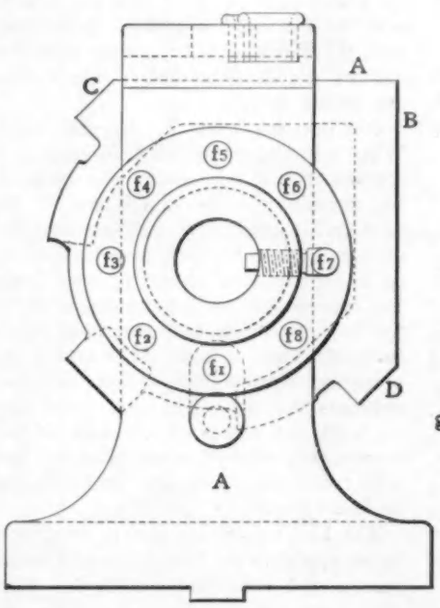


Fig. 3

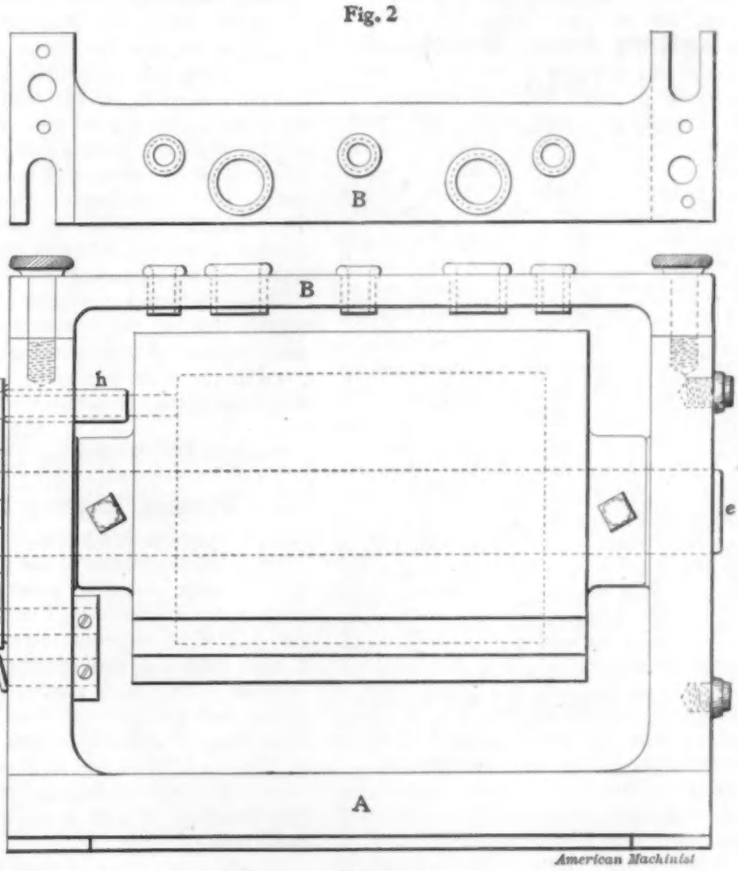


Fig. 4

COMBINATION PLANING AND DRILLING JIG.

The fixture is made with but two plain castings, *A* being the main piece, with two uprights, and is finished only on the bottom, top edges and right hand end. A hole is bored through the sides, the same size as the one in the casting; spots or hubs on the sides are faced true to the correct width to allow the casting to enter the fixture; a steel shaft is fitted free through the center of the fixture at *e*, on one end of which is fitted a steel index disk, with eight equally spaced holes. The index pin at *f*, which is connected with a push button *g* by a yoke, will be readily understood by the sketches.

Casting *B* is a plate with inserted tool-steel bushings, and is held on the top of the fixture by screws, for use in the drilling operations.

The manipulation of the fixture for its work is as follows: The casting to be machined is placed; the steel shaft with the index plate on its end is entered through casting and fixtures; setscrews are in-

serted through the hubs (utilizing the oil-cup holes for the screws), entering a slot in the shaft. The top plate *B* is not now in place, and the planing can commence with the side A continuing to side *B* by indexing from hole f^1 to hole f^8, Fig. 3; a pressure of the thumb to the button *g* and a turn of the casting by hand, and the planing can go on, until all the angles and slots are finished. The drilling plate *B* can then be added and the drilling be completed by indexing. The plate must be reversed "end for end," slots and holes being made extra for the purpose; the reversing of the plate being due to the fact of the holes in the casting being located in different directions from the center lines.

The jig can be turned on its end for drilling the end holes *k, l, m, n;* only one bushing and hole being used for drilling the four holes, and the accurate spacing being accomplished with the index plate; the holes in the index plate being made plenty large enough to allow the drill to clear and enter free to the bushing *h*.

Baltimore, Md.

Letters from Practical Men.

Locating Holes in a Jig.

Editor American Machinist:

We had completed a new assembling jig for the Linotypes, which we considered right, but on testing it with the frame and pedestal of the machine, we found it was out with the pedestals about .006 of an inch. That being more than the limit, we decided to alter the pedestal drill jig, and bring it right. Having driven out the hardened bushes and plugged the holes, the next thing to do was to lay it out. The fact that we had only one planed face to work from (that being the vertical face to which the pedestals are bolted) made the positions of the holes hard to locate.

After laying it out, boring and bushing the principal hole, then turning a 3-inch plug to fit it nicely, we proceeded to lay off the other holes, drill and bush them.

We found, on testing them with standard plugs and the 12-inch B. & S. verniers, an error of .004. As the job required to be within the thousandth, it was plainly evident that the drill press would never do.

Here was where the problem came in—the job was too big to swing in the lathe, and yet the hole had to be round and in the right place.

After some thought, I decided it could be done on the B. & S. Universal milling machine with the use of the vertical attachment, the cross and longitudinal graduations, the 12-inch verniers and the vertical feed.

By turning a spindle to fit the socket of the vertical attachment, drilling a hole in same and inserting a cutter, we have a small boring bar, and by clamping a parallel piece to the face, to which the pedestals were bolted, and with the use of the verniers, we found the distance from the outside of the boring bar to the face of the base. Then we deducted half the diameter of the boring bar and moved cross feed the number of thousandths we required.

After getting the first hole, and putting a nicely fitting plug in it, we then worked from that plug and the base, and so got them all.

The hardened and ground bushes were put in, and on testing it was found correct to the thousandth. By this method not only is a good job made, but you have the satisfaction of knowing that it is correct, which means a good deal in this world of worry.

The following are some other uses to which we put the vertical attachment: To locate holes and drill them in special pieces and in small jigs, we have a small drill chuck to fit the socket of the attachment, and by using a short, stiff centering drill and the different graduations, we get the location to a nicety.

To mill anything parallel with the centers and leave a nice face (something you cannot do with a milling cutter when the work is wider than the cutter, on account of the spring leaving ridges, and generally quite a mark, at the outer edge of the cutter), turn a good stiff spindle that will fit the socket, work a hole through it, either round or square, and forge a cutter with a short, stiff bend at the end, and long enough to sweep the piece. With the use of this you will find that you can make a good, satisfactory job.

These methods are original, and consequently new to me, but may be old to many others of the readers. I submit them in the hope that some may derive help from them.

T. S. Plaskett.

Linotype Co., Montreal.

The Working, Hustling Foreman.

Editor American Machinist:

From the publication of the initial number of your valuable paper until the present day I have been much interested (as a reader) in each successive issue. I have refrained from posing as a contributor, owing to a want of confidence in my ability to put my ideas into readable shape. I cannot therefore be accused of being a chronic kicker if at this late date I ask your indulgence while I call the attention of your readers to a perhaps unusual topic.

Nearly every issue of your paper contains one or more "ads." to this effect: "Wanted a working foreman; a hustler; a pusher; must be able to retain good men under him; etc., etc." Now, let me ask: Do these advertisers ever secure a man possessing all these requirements? I am convinced that they do not. A working foreman is a detriment rather than a benefit to his employer; he is a figure-head pure and simple. If a foreman conscientiously inspects the work upon which the men under him are engaged; if he directs the facilities and the methods by which such work is done, and performs the many like duties incidental to his position, his time is fully occupied, and it is absurd to suppose that at any time he can be otherwise engaged and still give to those duties the attention they demand. If he does attempt to "kill two birds with one stone" he misses both, and the best interests of his employers suffer. So much for the working foreman.

The hustler and the pusher come next in order. Ten hours' faithful service constitutes a day's work. By the terms hustler and pusher we understand a man who endeavors to get more than a faithful day's work out of a man under him; in which case the work produced does not by any means represent the best product of the man's skill. The hustling, pushing foreman is identical with the slave driver of unhallowed memory. The intelligent mechanic of to-day, however, is a product of this latter day civilization, and you cannot drive him with impunity. If he is so situated that he is obliged to submit to persecution he loses all ambition, and the result of his labor is far from being as satisfactory as it would be if he were encouraged in the faithful performance of his duty. Such a foreman cannot retain good men under him; they will secure more desirable positions at the first opportunity. In any case, the ability to retain good men lies largely with the firm employing them, rather than with the foreman, and depends upon the number of almighty dollars which they are willing to pay.

The question naturally suggests itself, What constitutes the ideal foreman? I contend that he is the man who gives all his attention to the supervision of the work in his department; who honestly endeavors to produce such work as quickly as it can be done correctly; who keeps the expense of his department down at the level where he has everything which he needs (and no more or less) for the proper production of his work; who encourages the men under him when they do well, and corrects them without unnecessary harshness when in error, and who treats them with the deference due to fellow beings.

The best results are always obtainable by an appeal to the better side of a man's nature, and encouragement by his foreman fosters confidence in a man's own ability; it follows that the firm reaps the benefit every time.

I do not aim at the reformation of the methods used by the advertisers in question; on the contrary, I congratulate them—if it is a cause for congratulation—if they ever secure such prodigies as they hope for. But I contend that the applicant for a position who declares that he is possessed of all these requirements is simply deceiving himself or trusting to

tne credulity of the prospective employer. and in the event that he who poses as a hustling, pushing foreman is successful in his application for such a position, he is not, to my mind, a desirable acquisition when secured.

JUSTICE.

A Micrometer Hight-Gage — The Twentieth Century Sketch Book.

Editor American Machinist:

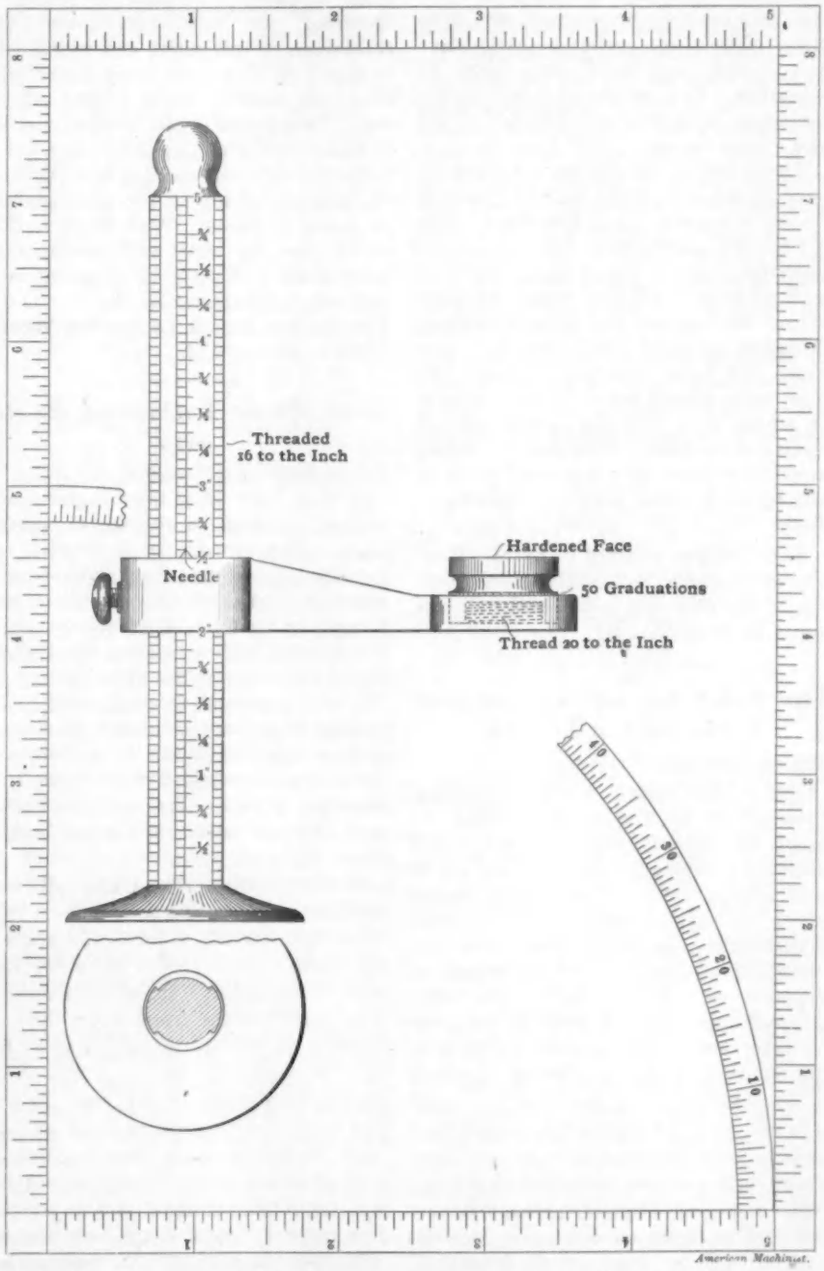
I send you a sketch of a hight-gage made on the plan of a surface-gage. It consists of a central standard fixed in a base. The standard is threaded throughout its length 16 threads (or any other number, for that matter), and then the threads are milled away, leaving a section on two opposite sides threaded, and on two other opposite sides blank. The inside of the nut enclosing the standard is relieved on two sides to correspond. This enables the rapid moving up or down of the arm by simply loosening the clamp screw that binds it, turning it one-fourth of the way round and then sliding it to the desired position of hight, swinging it round to a square position and fastening the screw again. To locate the area just right, a needle point is fixed on the top of the arm that with the marks on the standard determines its location and sets it central. The arm is extended and holds a round button of steel with hardened face. This button is bored and threaded to fit on a screw fastened in the end of the arm, as shown. Said screw is placed in a recess which is filled by the button. This button has 50 graduations marked on its circumference, and the screw is threaded 20 to the inch, allowing adjustments of one-thousandth of an inch.

The standard, graduated to sixteenths, makes a familiar reading, and the finer measurement can be obtained from the micrometer button. The top face of the button, when set at zero, is equal to the hight of the nut on the standard at the reading point. The button is limited to two revolutions, as the arm can be shifted to make the difference, and a reading of less than zero on the button is possible, thus compensating for the difference between the sixteenth thread on the standard and the 20 threads on the button.

The clamp screw is to have a soft metal seat to bear against the thread when fastening the arm to place. The whole to be finished, and makes a handy, quick and reliable tool. C. A. BURTON.

Kansas City, Mo.

[The cut accompanying the above letter serves, as will be observed, a double purpose. It not only shows the hight-gage described in the letter, but it also presents to our view a sheet of "The Twentieth Century Sketch Book." The cut is considerably smaller than the real size of the sheet, as indicated by the graduated border of the sheet, which in the original is of course full size. The cut not only shows the device, but also allows it to speak for itself as to its utility. Paper, correctly graduated at the edges as here shown, is put up in books or pads of fifty leaves, and sketches may be made to measure upon it with the aid of only a pencil and straight-edge and a pair of compasses when circles are to be drawn. There are no objectionable lines on the sketch itself, as are inevitable with the use of section paper. The paper is furnished with simply the straight graduated border, or with also the 90-degree quadrant, a broken portion of which is shown. The center of the quadrant is at the lower left-hand corner, and the graduations extend from the lower right-hand corner up to the 5-inch mark on the left side, embracing 90 degrees, in half-degree divisions. "The Twentieth Century Sketch Book" is made by M. H. Avery, Woonsocket, R. I.—Ed.]



A MICROMETER HIGHT-GAGE—SKETCHED IN THE TWENTIETH CENTURY SKETCH BOOK.

What the Little Shop Can Do.

Editor American Machinist:

Your editorial in January 12 issue, on "What Can a Little Shop Do?" is a very pertinent one on a very pertinent question. A little shop is generally the outgrowth of the efforts of a "simon pure" machinist who has saved a few dollars and concluding to be his own boss, sets up for himself, and in due time engages in the repair business. Others follow suit, and he soon finds his trade divided, until his shop don't pay on this work and he looks about for some "specialty." Here is the place where is to be determined whether his future is an assured success or a failure.

These are the days of specialized ma-

chinery. Makers of goods designed for the general trade adopt a line of manufacture, whether this line is one already pretty full or not, and proceed to "manufacture," not "make" them; that is, all goods are made on the duplicate or interchangeable plan, and to do this costs money.

Your correspondent, I fancy, has looked the vast field over for something to make; has become bewildered at the multiplicity of articles in each special line adaptable to his shop, and fails to arrive at any definite conclusion as to what line to adopt, because of the fear that he cannot compete with larger and well-established firms; or, that he may take up a line that won't pay.

Now, the fact of it is that a small shop, in the sense of its being a shop having few tools, and with limited capital, is in no sense capable of holding out against the larger corporations, for trade in their special lines. If the small shop, with few tools, has money behind it, it is possible for it to force its way into the trade and secure business; but lacking capital and special machinery for special work, its failure is a certainty at the outset.

A large firm engaged in making a small article inform me that it involved an expense of $3,000 to get ready to manufacture this tool; and to get out the tools, templates, dies and other special tools to properly manufacture four or five special articles would cost upwards of $20,000. This experience is such as generally deters the small shop, determines its policy and fixes its scope.

An alternative is suggested by your editorial, and that is by securing absolute control of an article, and then manufacturing it and crowding it into the trade at any cost. Examples of the small shops that have grown to large proportions are plenty, and their success has generally been due to their adoption of a line and everlastingly sticking to it. But examples of small shops that start out with limited facilities and capital that succeed in competing with the large, well equipped and wealthy companies, are very few.

Your correspondent only voices the desires of thousands of men who would be glad to know what to make in their small shops and make their business a paying one. Generally speaking, they rarely get beyond the familiar stage of the repair shop. If a small shop can, by patient effort toward a definite end, and by putting its profits into machine tools that are designed for rapid duplication of work, and, in connection therewith, obtaining an exclusive right to make an article that will be new, novel and cheap, then it is not so hard a problem to build up a growing and profitable business; but the process is a trying one, and only those of the most sterling qualities survive the ordeal. Equally difficult is it to find a specialty of this kind, as all lines seem to be full. The problem is a knotty one for more than your correspondent, and so far as I can see, is one that each man must solve for himself.

C. A. BURTON.

Kansas City, Mo.

Punched Letters and Figures for Tracings.

Editor American Machinist:

Noting the communications of Mr. Webber, printed in your issues of December 1, 1898, and January 19, 1899, with reference to the lettering of drawings and tracings, we send you herewith an illustration of the method used by us for some time past with perfect satisfaction. We employ adhesive letters and figures which are punched out of closely woven and glazed black cloth, and are gummed on the under side so that they will adhere to paper, tracing cloth or leather so perfectly that they can only be removed with difficulty. These are perfectly sharp, clear and opaque, and print clear white on blueprints. This method is free from the untidiness attendant upon the use of ink and rubber stamps.

These letters and figures are made in various sizes and styles by The Tablet & Ticket Company, 318 Broadway, New York. We employ them for various purposes other than the marking of drawings, as, for example, for the consecutive numbering of volumes and filing envelopes. Although we have used them for some time, and to a considerable extent, we have never known one of them to become detached, even from the glazed side of tracing cloth. We enclose samples of two sizes on a card, also a lettered piece of tracing cloth and a blueprint made therefrom.

W. H. HONISS.

[The samples referred to by Mr. Honiss bear evidence of the satisfactory working of this plan. In fact, it seems all that could be desired.—Ed.]

Cox Pulley and Gearing Computer Gives Gear of Bicycles.

Editor American Machinist:

As an illustration of the occasional slowness of the average human brain to grasp an obvious fact, I will say that I have just discovered that the Cox pulley and gearing computer is a mighty handy thing to compute the gear of bicycles. Place the number on the inner circle representing the diameter of the wheel, to coincide with the number on the outer circle representing the teeth in the large sprocket, say 20, and opposite the number on the inner circle representing the teeth in the small sprocket, say 8, will be found the gear, 70. Of course this should have been apparent at first glance, but as I have never seen this use mentioned in connection with the computer, perhaps it may be new to others as well.

J. F. BRADLEY.

Valparaiso, Ind.

The Horse-Power of the Largest Tangential Water Wheel.

Editor American Machinist:

Referring to your paper of November 10 there is described on page 831 an air compressor with a large tangential water wheel; on page 836 mention is made that this water wheel was made by Cobb & Heselmeyer, of San Francisco. This is an error, as the wheel was built by us. The patent under which this wheel was constructed was issued to Mr. Cobb, of Cobb & Heselmeyer, but as far as the work of this wheel is concerned it was accomplished at our works and by ourselves. We note in the issue of December 22 that Mr. Robert A. Bruce refers to the article in the previous number and calls attention to the capacity or the horse-power of the water wheel. We enclose herewith a circular on which is described the size, horse-power and revolutions of this wheel, and would state it would develop 1,000 horse-power with three 1¾ nozzles under a head of 775 feet. This nozzle is not a round one, but is made with a rectangular orifice and a hydraulic cylinder opening and shutting the aperture, giving off the exact quantity of power required. With three nozzles of this size the wheel will develop 1,000 horse-power, or 333⅓ horse-power each, and not 450, as stated by you.

THE RISDON IRON & LOCOMOTIVE WORKS.

San Francisco, Cal.

Some Marine Engineering Experience.

Editor American Machinist:

In May, 1893, while third engineer of a steamer engaged in the frozen mutton trade, sailing between the River Plate and Liverpool, I had the following experience, which may interest fellow engineers, and, I hope, at the same time be instructive. We finished loading, having about 18,000 frozen carcasses in the after part of the ship and a general cargo forward. Our refrigerating plant consisted of a large cold-air machine driven by a compound steam engine, supplied with steam from the main boilers. The machine worked well, although rather extravagant both on steam and fuel.

We left Buenos Ayres, and all went smoothly until our ship entered the tropics, when one morning a crash was heard in the machine room, followed by the stoppage of the engine. Upon examination it was found that the crosshead of the compression engine had broken, as at *F*, Fig. 1. The crosshead and piston rod of this engine were made of one solid forging, and as we had no spare one on board, and were dependent upon the compression, cooling and expansion of air, our machine was completely disabled, and as we were in a tropical climate it was necessary that what was done should be done without loss of much time, as the temperature in

the cold chambers would soon rise and the mutton would be ruined.

We first took a spare crosshead bolt and flattened the head end like a palm stay, and pinned it with two set bolts to the piston rod. Then we coupled up and started the machine. She ran for about fifteen minutes, when the bolt carried away at the weakened end.

This failure did not discourage us, however. We next made a plate to pass over the piston rod, this plate having two holes for the crosshead bolts. Not having any suitable iron in the engine-room store, we took a small Kedge anchor from the deck and cut a piece from it which was 4 inches thick. This we heated in the furnace fires and swaged down to 2¾ inches, which was the clearance which the heads of the bolts and the packing gland on the cylinder would allow. We then drilled three holes and had a plate similar to Fig. 2. Our spare crosshead bolts were too short,

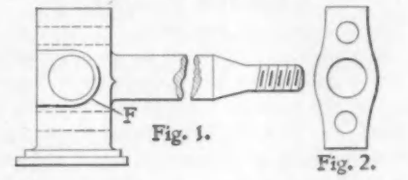


Fig. 1.

Fig. 2.

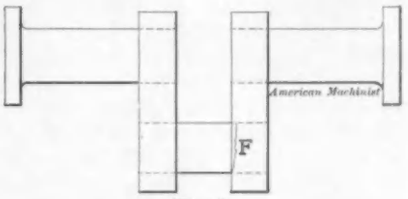


Fig. 3.

REPAIR JOBS ON A TRAMP STEAMER.

but fortunately we had spare ones belonging to the crank pin which suited nicely. Making this plate with our imperfect ship tools and drilling tackle took considerable time and labor. We put it in position, coupled up and started the machine. It worked well, and we thought our troubles for that voyage were at an end.

However, our hopes were shattered when, about a week later, and nearing Cape de Verde Islands, we heard a peculiar knocking commence on the main engines. At the same time the main bearing brass next the after crank pin began to get hot. We slowed the engines and observed that at each revolution the webs of the after crank were springing. The weather was rough, and the captain ran the ship under the lee of an island and anchored for shelter. We took off the crank pin brasses and discovered that the crank pin was broken just inside the web. This was our after crank, but we had a spare one that had been a forward one, but was taken out on account of a flaw. The chief engineer decided to fit it in the place of the broken one. We rigged blocks and tackle and let the tackle fall through the engine room skylight to a steam cargo winch on deck, disconnected the couplings and took out the shaft, which came away in two pieces. We then put in the spare one, and the couplings and bolts required little fitting. We had to cut keyseats for the eccentric sheaves, which fitted on over the outside of the couplings. We did not waste much time fitting or scraping the crank pin and main bearing brasses, as we knew the shaft would require to be taken out again in Liverpool, so we coupled all up and proceeded under easy steam after being stopped only twenty-eight hours. We carried four engineers, and considering the nature of the repairs and the labor involved, it was hard work. The ship arrived at her destination safely with the frozen meat in first-class condition.

W. T. SMITH.

"S. S. Campania."

A Quickly Made Pattern.

Editor American Machinist:

Pattern-making, like other trades, differs as to the best and the quickest methods of construction. I had occasion to see two men do a duplicate job, which goes to show this fact. Two patterns were made for a special job, and only one casting of each was wanted in brass. The shape and sizes of one are shown in Figs. 1 and 2. The other was ¼ inch larger in every way, excepting length, which remained the same. Figs. 1 and 2 show the article when completed.

Mr. X—— constructed his as shown in Figs. 3, 4, 7 and 8. Strips were glued together as shown, the inner circle was cut out with a core box plane, an arbor was

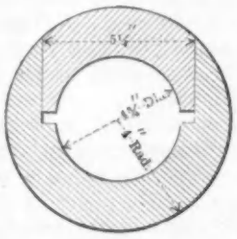


Fig. 1

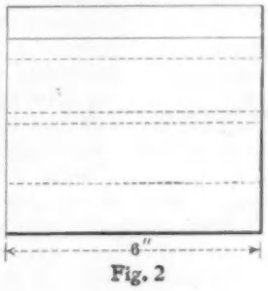


Fig. 2

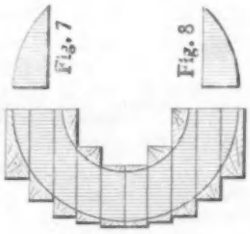


Fig. 3

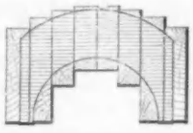


Fig. 4

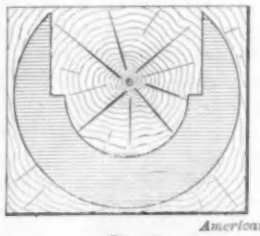


Fig. 5

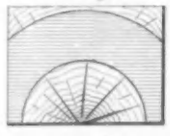


Fig. 6

TWO WAYS OF MAKING A PATTERN.

then turned the diameter of the hole, and Figs. 3 and 4 were dogged on, and a wood screw put in each half to hold them secure on the arbor. The outside was then turned, and after this it was taken apart and Figs. 7 and 8 were made and fastened in their proper places. Mr. X—— was six hours making it.

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Worcester, Mass.

Micrometer Depth-Gage.

Editor American Machinist:

In the accompanying sketches I show a micrometer depth-gage which I constructed some time ago and have since had in frequent use. It is inexpensive to make, and to me seems to have points of advantage over other tools for the same purpose now on the market. The frame may be a malleable iron casting, or may be milled from soft steel, case hardened and the base ground true.

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In Fig. 1 it may be observed: First, that the sliding rod *A* is graduated with fine lines running entirely around and ¼ inch apart. Second, the sliding piece *B* can, by means of the micrometer nut *C* and screw *D*, together with the spring *E*, be given a movement on *A* of ¼ inch. Third, an indicator point on *B* traverses graduations on the side of the frame. These are .025 inch apart, corresponding to one revolution of *C*. Fourth, there is a line on *B* where *A* is exposed that may be adjusted opposite any line on *A*. Fifth, one end of *A* has a large and the other a small contact face. Either end may be used down. Sixth, inserted in the lower end of *D* is a small broad-headed screw, forming a shoulder against which *B* is

chinery. Makers of goods designed for the general trade adopt a line of manufacture, whether this line is one already pretty full or not, and proceed to "manufacture," not "make" them; that is, all goods are made on the duplicate or interchangeable plan, and to do this costs money.

Your correspondent, I fancy, has looked the vast field over for something to make; has become bewildered at the multiplicity of articles in each special line adaptable to his shop, and fails to arrive at any definite conclusion as to what line to adopt, because of the fear that he cannot compete with larger and well-established firms; or, that he may take up a line that won't pay.

Now, the fact of it is that a small shop, in the sense of its being a shop having few tools, and with limited capital, is in no sense capable of holding out against the larger corporations, for trade in their special lines. If the small shop, with few tools, has money behind it, it is possible for it to force its way into the trade and secure business; but lacking capital and special machinery for special work, its failure is a certainty at the outset.

A large firm engaged in making a small article inform me that it involved an expense of $3,000 to get ready to manufacture this tool; and to get out the tools, templates, dies and other special tools to properly manufacture four or five special articles would cost upwards of $20,000. This experience is such as generally deters the small shop, determines its policy and fixes its scope.

An alternative is suggested by your editorial, and that is by securing absolute control of an article, and then manufacturing it and crowding it into the trade at any cost. Examples of the small shops that have grown to large proportions are plenty, and their success has generally been due to their adoption of a line and everlastingly sticking to it. But examples of small shops that start out with limited facilities and capital that succeed in competing with the large, well equipped and wealthy companies, are very few.

Your correspondent only voices the desires of thousands of men who would be glad to know what to make in their small shops and make their business a paying one. Generally speaking, they rarely get beyond the familiar stage of the repair shop. If a small shop can, by patient effort toward a definite end, and by putting its profits into machine tools that are designed for rapid duplication of work, and, in connection therewith, obtaining an exclusive right to make an article that will be new, novel and cheap, then it is not so hard a problem to build up a growing and profitable business; but the process is a trying one, and only those of the most sterling qualities survive the ordeal. Equally difficult is it to find a specialty of this kind, as all lines seem to be full. The problem is a knotty one for more than your correspondent, and so far as I can see, is one that each man must solve for himself.

C. A. BURTON.

Kansas City, Mo.

Punched Letters and Figures for Tracings.

Editor American Machinist:

Noting the communications of Mr. Webber, printed in your issues of December 1, 1898, and January 19, 1899, with reference to the lettering of drawings and tracings, we send you herewith an illustration of the method used by us for some time past with perfect satisfaction. We employ adhesive letters and figures which are punched out of closely woven and glazed black cloth, and are gummed on the under side so that they will adhere to paper, tracing cloth or leather so perfectly that they can only be removed with difficulty. These are perfectly sharp, clear and opaque, and print clear white on blueprints. This method is free from the untidiness attendant upon the use of ink and rubber stamps.

These letters and figures are made in various sizes and styles by The Tablet & Ticket Company, 318 Broadway, New York. We employ them for various purposes other than the marking of drawings, as, for example, for the consecutive numbering of volumes and filing envelopes. Although we have used them for some time, and to a considerable extent, we have never known one of them to become detached, even from the glazed side of tracing cloth. We enclose samples of two sizes on a card, also a lettered piece of tracing cloth and a blueprint made therefrom.

W. H. HONISS.

[The samples referred to by Mr. Honiss bear evidence of the satisfactory working of this plan. In fact, it seems all that could be desired.—Ed.]

Cox Pulley and Gearing Computer Gives Gear of Bicycles.

Editor American Machinist:

As an illustration of the occasional slowness of the average human brain to grasp an obvious fact, I will say that I have just discovered that the Cox pulley and gearing computer is a mighty handy thing to compute the gear of bicycles. Place the number on the inner circle representing the diameter of the wheel, to coincide with the number on the outer circle representing the teeth in the large sprocket, say 20, and opposite the number on the inner circle representing the teeth in the small sprocket, say 8, will be found the gear, 70. Of course this should have been apparent at first glance, but as I have never seen this use mentioned in connection with the computer, perhaps it may be new to others as well.

J. F. BRADLEY.

Valparaiso, Ind.

The Horse-Power of the Largest Tangential Water Wheel.

Editor American Machinist:

Referring to your paper of November 10 there is described on page 831 an air compressor with a large tangential water wheel; on page 836 mention is made that this water wheel was made by Cobb & Heselmeyer, of San Francisco. This is an error, as the wheel was built by us. The patent under which this wheel was constructed was issued to Mr. Cobb, of Cobb & Heselmeyer, but as far as the work of this wheel is concerned it was accomplished at our works and by ourselves. We note in the issue of December 22 that Mr. Robert A. Bruce refers to the article in the previous number and calls attention to the capacity or the horse-power of the water wheel. We enclose herewith a circular on which is described the size, horse-power and revolutions of this wheel, and would state it would develop 1,000 horse-power with three 1¾ nozzles under a head of 775 feet. This nozzle is not a round one, but is made with a rectangular orifice and a hydraulic cylinder opening and shutting the aperture, giving off the exact quantity of power required. With three nozzles of this size the wheel will develop 1,000 horse-power, or 333⅓ horse-power each, and not 450, as stated by you.

THE RISDON IRON & LOCOMOTIVE WORKS.

San Francisco, Cal.

Some Marine Engineering Experience.

Editor American Machinist:

In May, 1893, while third engineer of a steamer engaged in the frozen mutton trade, sailing between the River Plate and Liverpool, I had the following experience, which may interest fellow engineers, and, I hope, at the same time be instructive. We finished loading, having about 18,000 frozen carcasses in the after part of the ship and a general cargo forward. Our refrigerating plant consisted of a large cold-air machine driven by a compound steam engine, supplied with steam from the main boilers. The machine worked well, although rather extravagant both on steam and fuel.

We left Buenos Ayres, and all went smoothly until our ship entered the tropics, when one morning a crash was heard in the machine room, followed by the stoppage of the engine. Upon examination it was found that the crosshead of the compression engine had broken, as at *F*, Fig. 1. The crosshead and piston rod of this engine were made of one solid forging, and as we had no spare one on board, and were dependent upon the compression, cooling and expansion of air, our machine was completely disabled, and as we were in a tropical climate it was necessary that what was done should be done without loss of much time, as the temperature in

the cold chambers would soon rise and the mutton would be ruined.

We first took a spare crosshead bolt and flattened the head end like a palm stay, and pinned it with two set bolts to the piston rod. Then we coupled up and started the machine. She ran for about fifteen minutes, when the bolt carried away at the weakened end.

This failure did not discourage us, however. We next made a plate to pass over the piston rod, this plate having two holes for the crosshead bolts. Not having any suitable iron in the engine-room store, we took a small Kedge anchor from the deck and cut a piece from it which was 4 inches thick. This we heated in the furnace fires and swaged down to 2¾ inches, which was the clearance which the heads of the bolts and the packing gland on the cylinder would allow. We then drilled three holes and had a plate similar to Fig. 2. Our spare crosshead bolts were too short,

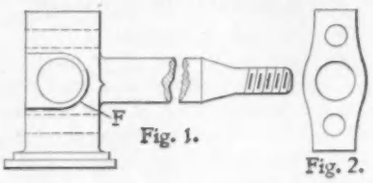

Fig. 1.

Fig. 2.

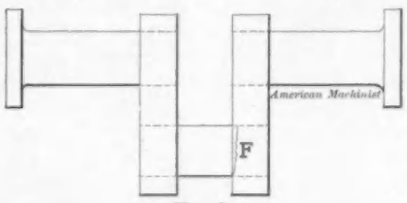

Fig. 3.

REPAIR JOBS ON A TRAMP STEAMER.

but fortunately we had spare ones belonging to the crank pin which suited nicely. Making this plate with our imperfect ship tools and drilling tackle took considerable time and labor. We put it in position, coupled up and started the machine. It worked well, and we thought our troubles for that voyage were at an end.

However, our hopes were shattered when, about a week later, and nearing Cape de Verde Islands, we heard a peculiar knocking commence on the main engines. At the same time the main bearing brass next the after crank pin began to get hot. We slowed the engines and observed that at each revolution the webs of the after crank were springing. The weather was rough, and the captain ran the ship under the lee of an island and anchored for shelter. We took off the crank pin brasses and discovered that the crank pin was broken just inside the web. This was our after crank, but we had a spare one that had been a forward one, but was taken out on account of a flaw. The chief engineer decided to fit it in the place of the broken one. We rigged blocks and tackle and let the tackle fall through the engine room skylight to a steam cargo winch on deck, disconnected the couplings and took out the shaft, which came away in two pieces. We then put in the spare one, and the couplings and bolts required little fitting. We had to cut keyseats for the eccentric sheaves, which fitted on over the outside of the couplings. We did not waste much time fitting or scraping the crank pin and main bearing brasses, as we knew the shaft would require to be taken out again in Liverpool, so we coupled all up and proceeded under easy steam after being stopped only twenty-eight hours. We carried four engineers, and considering the nature of the repairs and the labor involved, it was hard work. The ship arrived at her destination safely with the frozen meat in first-class condition.

W. T. SMITH.

"S. S. Campania."

A Quickly Made Pattern.

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Pattern-making, like other trades, differs as to the best and the quickest methods of construction. I had occasion to see two men do a duplicate job, which goes to show this fact. Two patterns were made for a special job, and only one casting of each was wanted in brass. The shape and sizes of one are shown in Figs. 1 and 2. The other was ¼ inch larger in every way, excepting length, which remained the same. Figs. 1 and 2 show the article when completed.

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G. H. WILLARD.

Worcester, Mass.

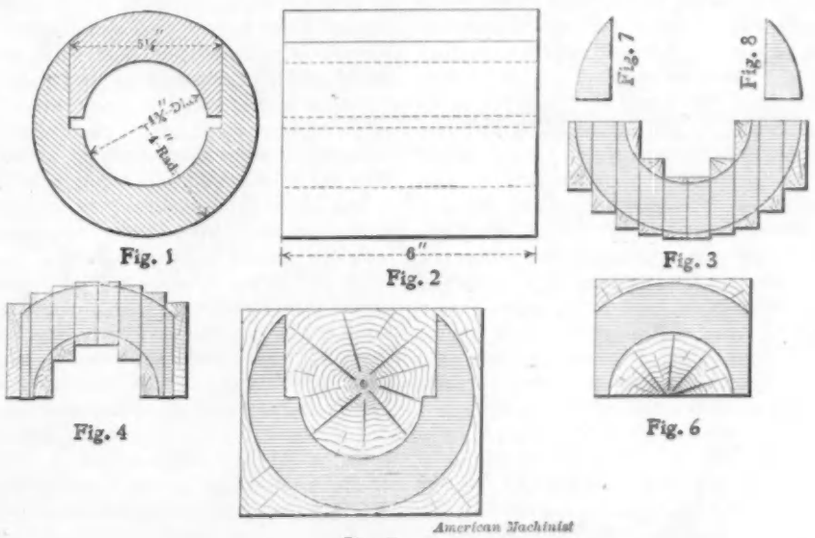

Fig. 1 Fig. 2 Fig. 3

Fig. 4 Fig. 6

Fig. 5

TWO WAYS OF MAKING A PATTERN.

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held by the pressure of the spring *E*. This is shown better in Fig. 3.

Fig. 5, which is a plan of sliding piece *B*, shows the manner in which *D* is held adjustably in *B*. This is similar to the clamping device for the anvil adjustment on Brown & Sharpe micrometers. The tapped hole for the screw is counterbored, as shown by the dotted lines, and is so situated that a portion of the screw head

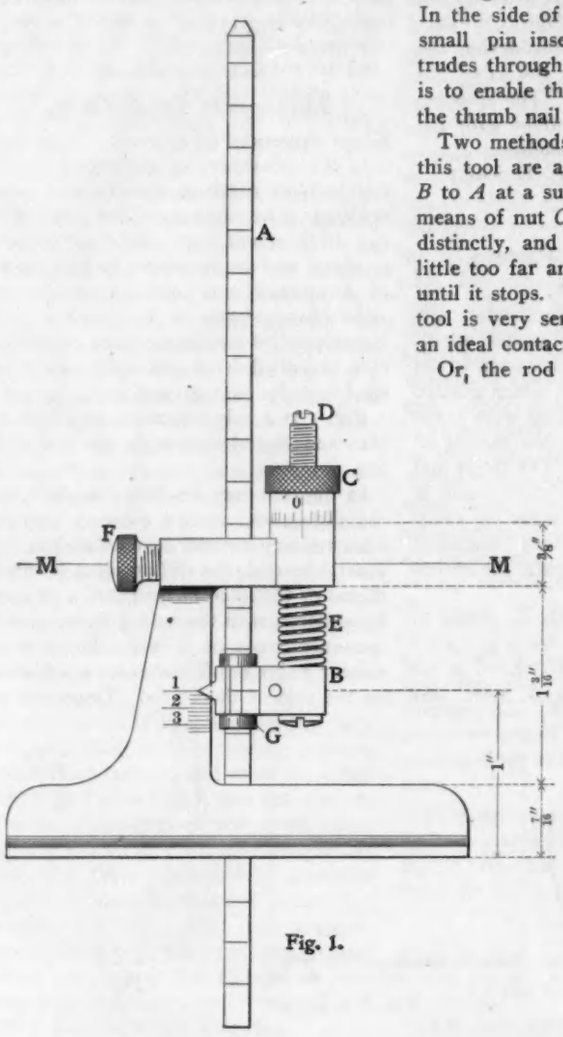

Fig. 1.

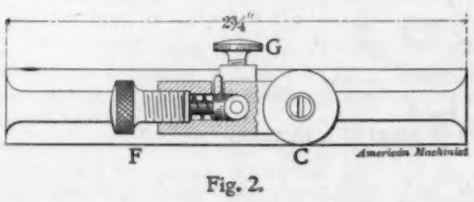

Fig. 2.

A MICROMETER DEPTH-GAGE.

binds against *D*, making a very rigid connection.

G, in Figs. 1, 2 and 4, is a U shaped piece embracing *B*, each leg encircling rod *A*, and is provided with a set screw to tighten against *B*. This is used to clamp *B* to *A* when desired.

Fig. 2 shows the device for clamping rod *A* in the frame. The knurled screw *F* acts against a small shoe, the face of which conforms to the round surface of *A*. On this shoe is turned a stem which is encircled by a coil spring, one end of which presses against the screw *F*. This spring keeps a constant pressure of the shoe against *A*, which is quite important. In the side of the shoe can be noticed a small pin inserted, which slightly protrudes through a slot in the frame. This is to enable the shoe to be held back by the thumb nail while *A* is being reversed.

Two methods of measuring depths with this tool are apparent. One is to clamp *B* to *A* at a suitable line, then operate by means of nut *C*. The contact is felt very distinctly, and the nut may be turned a little too far and then turned back lightly until it stops. When used in this way the tool is very sensitive. The spring causes an ideal contact between *A* and the work.

Or, the rod *A* may be used independently and slid down to contact and tightened with knurled screw *F*. The nut *C* may then be adjusted till the lines match and the reading is taken.

When *B* is clamped to *A* at a suitable line, the gage is very handy to apply to the work as it progresses, when the exact amount still to be planed or milled off can be seen at a glance. Or the micrometer can be set at the proper reading and the rod *A* used independently. Then the amount still to be removed can be judged by noting the proximity of the line on *A* to that on *B*.

This tool can be adjusted for wear at any time by setting *A* flush and nut *C* at zero, then loosening the binding screw in the back of piece *B*, and turning *D* with a screw driver until the lines on *A* and *B* coincide, then resetting the binding screw.

In marking the graduations on the frame they should be so placed that this operation will bring the indicator point practically opposite 0 or .250 inch.

H. B. McCABE.

Cleveland, Ohio.

Fig. 3.

Fig. 4.

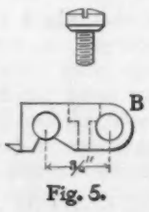

Fig. 5.

An Adjustable Planer-Gage.

Editor American Machinist:

I send you a drawing of an adjustable planer-gage. This gage comprises a frame *A*, on the inclined edge of which slides a block *B*. This block is secured in any desired position by the knurled screw, and has vernier graduation on the edge reading to thousandths. The graduations on the side shown are in tenths and fractions; on the other side graduations can be made in sixteenths and fractions. These graduations are made to measure the vertical rise of the block. The entire scope of the gage is 2 inches. The base of the frame is graduated in sixteenths and fractions to 6½ inches on one side; the other side of the base can be made to read in metric measure or in other fractions of the inch. The block *B* can be made adjustable with a screw running the whole length of the frame; but as this adds to the cost, and is slow of action, this seems to me the best. The frame is lightened as much as possible. I show a gib for the screw to bear against, to prevent any tendency to lift the block, and to avoid marring the surface of the bevel face. Hope it may be of service to my fellow craftsmen.

C. A. BURTON.

It is safe enough already to assert that the battle of the automobile cab has been won in New York City. The public has "caught on" and the cabs are now well patronized. They are seen in all parts of the city, very generally carrying passengers, and evidently also getting along faster than was the fashion with the horses. We are doubtless to witness a long stage of development and of successive improvement. The present storage battery cabs are nearly as ugly as it is possible to imagine, while some automobile delivery wagons of a leading dry-goods house are really pleasant to look upon. They encourage us to believe that ugliness is not an essential feature of the automobile vehicle.

Specifications, Guarantees and Tests.*

It is frequently stated by buyers of railroad material and others in a position to know that when no specifications and tests are made use of goods can in general be bought cheaper than when these are employed. There is undoubtedly, many times, much truth in this statement, for frequently specifications are not clearly drawn up, or, more often, when explicit, are not prepared with a careful consideration of the uses to which the article is to be put, and specify a higher quality and require more severe tests than are necessary. In the first case, the bidder will take advantage of the doubt by giving high prices and delivering poor goods; in the other case, specifications and tests being severe, something will be secured more costly than is required. Where there are no specifications the exact article desired is not defined, and there is always an open chance for the dishonest bidder to figure on supplying something inferior to what the honest bidder is intending to give. The result of this is that we get a low price but we do not get what we originally intended to buy.

Buying of responsible parties is excellent practice, but such parties are the people above all others who desire specifications, and will sell at the same price as without them. A specification is simply a minute description or enumeration of particulars, and a test, when used in this connection, is simply some method of determining whether the article in question fulfils this enumeration of particulars. It is impossible to conceive that any reliable manufacturer would make any difference in price because the article desired was described minutely, and if reliable he would not object to applying a reasonable test to show that the finished article corresponded to this description.

There are men who claim that a guarantee is a cure for all evils, and that where this can be obtained no test of material is required. What does a guarantee usually consist of, even when made by responsible parties? Simply a promise to supply a new part for any one that fails within a definite period of time. This is good as far as it goes, and has done much to improve the quality of certain articles of manufacture, such as the wearing capacity of cast iron car wheels. But a guarantee is not sufficient. A railroad company wants assurance not only that the wheels it buys will, in general, not wear out in five or six years, but it wants assurance that in all reasonable probability no wheel will break before it wears out, and thus cause a wreck. If a wheel wears out or breaks within the specified time, the wheel company loses the value of the wheel, nearly $5, but if the wheel breaks and causes a wreck, the railroad company loses possibly as many thousands. The guarantee is of little value in this case. We want the assurance furnished by some positive test that the wheel will not break.

A large part of railroad material is such that its unexpected and premature failure means loss of life, loss of property, delay to train service, or rolling stock laid up for repair; in any event meaning loss of money to the company. To avoid this we should know to a certainty the quality of the material used and its ability to resist the service it will receive. This can only be surely known by specifying the quality required and testing the material before use.

It is then fair to conclude that, with important railroad material, specifications and tests are essential to insure the quality being that which is required. The quality being thus guaranteed, calculations may be based upon working the material to its fullest capacity, thus saving quantity, less accidents and delays will occur, and the cost being little if any greater than material of a doubtful character, the result will be largely on the side of economy.

To guard against the cost being increased by the specifications, it is essential that the specifications should be adapted to the material and to the service required of it, and not specify tests that are more severe than the occasion demands. Important material upon which much depends, and in which failure would be disastrous, should be subjected to tests much more severe than will ever come upon it in actual service to allow an ordinary factor of safety, while material in which a failure would be of small importance other than its renewal at a convenient time, should be required to stand tests no more severe than the actual work required of it; in the latter case the material to be guaranteed when practicable.

For example, the failure of a car axle would usually result in disaster, and a guarantee is of no value. The usual drop test, requiring it when resting on supports three feet apart to withstand, without breaking, a certain number of blows of a 1,640 pound weight falling a definite hight of twenty to forty feet, according to size of axle, is none too severe, though many times more severe than any shocks the axle can receive in actual service.

On the other hand, the failure of a draft spring does not ordinarily result in anything more serious than the inconvenience of replacing it with another, and the test required here may only be such as will insure that it will resist a certain amount of pressure before closing, and that it returns to its original hight when free.

According to the material in hand, we may specify chemical tests to determine composition, physical tests to determine strength and adaptability, service tests to determine the operation or durability, and careful inspection, which is also a test, to determine the character of workmanship. This diversity in character as well as in the severity of tests is very desirable if properly applied, but the application should be made with judgment and care, adapting the test to the service required.

When practicable, it is more desirable to make physical tests upon material in its finished state and full size than upon small samples made independently or cut from the finished article.

It is also sometimes essential that some special test should be devised to insure some particular quality under unusual conditions. As an example of the necessity of this, consider once more cast iron car wheels. As previously mentioned, they are a very important class of material, the safety of a whole train depending upon the character of each and every wheel. The guarantee has done much to improve the quality, but it has been shown the guarantee is not the insurance needed against broken wheels. The drop test is therefore resorted to to determine its strength and toughness under ordinary conditions. But of late, since the age of high capacity cars has been upon us, it is found that brakes must be applied much more constantly while descending grades and the friction of the brake shoes suddenly heats the tread of the wheel while the hub is still cool. This has a tendency to break the wheel, and we have failures from this cause. To fill these requirements the thermal test has been proposed and adopted by the Pennsylvania Railroad and is now being experimented with by some others. The molten iron coming in contact with the tread of the wheel heats it somewhat similarly to the brake shoe, but possibly more suddenly. It is presumed that if the wheels will stand this test without breaking they will stand the heating of the brakes and allow a reasonable factor of safety.

In devising special tests, or in specifying any form of test for important material where the test must necessarily be severe in character, the methods of manufacture must be considered, and care must be exercised that the test is not more severe than can be met with certainty by the manufacturer without unnecessary expense, provided the latter exercises reasonable care in the selection of raw material and in the process of manufacture. We may, for certain special purposes, desire an article or quality which can only be produced by extra expense in manufacture, and when the necessity for the quality justifies the extra expense, we should insist upon having tests that will insure what is desired. But when possible we should limit requirements to the results obtained in ordinary methods of manufacture. Otherwise we shall certainly increase the price.

A prominent manufacturer recently said to me while talking of a new form of

(*Concluded on page* 117.)

*Abstract of a paper read before the North-West Railway Club, by Alfred Lovell, Assistant Superintendent Motive Power, N. P. R. R.

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Mode of Changing the Motive Power of the Manhattan Elevated Railway.

To the many residents and non-residents of New York City, who regularly or occasionally have to traverse its inconvenient longitudinal distances, the Manhattan Elevated Railway has been, and still is, an institution of considerable importance. The road has been of great service to the city in promoting its rapid upbuilding; but it has not itself grown or developed with the city, and it is now woefully and apparently hopelessly behind the times. There is no visible thing in which its methods have improved in a dozen years, notwithstanding the advances which have been made in other modes of urban transportation. While the road, at first a convenience, soon became a necessity, it is now regarded as a necessary evil. The management of the road has not been true to either the interests of the citizens of New York or to the financial interests of the road itself, as is clearly evidenced by the actual decrease in its revenues. Many of its richest opportunities for developing business have been appropriated by other lines, which will doubtless be able to retain them. The rapid growth of the city, however, and the constant demand for increased facilities of transit, constitute a perennial opportunity, and there would still be a future of possible vast development of business, if the management were wise in its generation.

We are interested in the "L" from a mechanical standpoint. One of the apparently greatest needs of the road at the present time is a change in its motive power. This has been talked of for years, and one or two, although apparently inadequate and inconclusive, experiments have been made upon its lines with both electricity and compressed air. At this writing the long-talked of change is apparently near, but in connection with it we are treated to a characteristic exhibition of the peculiar ways of the management. Mr. George J. Gould and Mr. Russell Sage are the controlling minds of the "L," and Mr. Sage sometimes talks. The following, from a recent interview with Mr. Sage, as reported in the "New York Times" of February 2, will be of interest to our readers, and it requires no comments or explanations from us. Many remarkable claims have been made for compressed air, and many strange statements concerning electricity, but it is not easy to beat Mr. Sage. He is reported to have said in part:

"While electricity appeals to most people, it is really wonderful what remarkable experiments have been made in the matter of compressed air. I received a letter yesterday from the president of the Delaware & Hudson Company relative to some experiments that an engineer of his road had made with compressed air. The results of these experiments are really wonderful. I handed the letter to Vice-President Skitt to hand to Mr. Gould. I remember in the letter it was stated that the experiments showed that electricity was 72-100 cheaper per mile than steam, and compressed air 412-100 cheaper per mile than steam. This makes compressed air nearly six times cheaper. And the letter also showed that compressed air was more effective than electricity. This is in line with the many statements that have been made concerning the recent experiments with compressed air. Mr. Yerkes, of the Chicago Street Railroad Company, called on me last week and told me some wonderful things relative to the experiments with compressed air. He said he would call on me again next week and bring some statements from his engineer, and perhaps the engineer himself.

"When I was with the Fitchburg Road an engineer engaged in constructing the Hoosac Tunnel made some experiments with compressed air. This engineer is still at work on the matter. He stated to me once that if I placed a tank of compressed air at the South Ferry the motors could be filled from it in a short time, and then have enough power to carry them to the end of the road.

"This matter of electricity seems to me to be rather uncertain. No one seems to know so very much about it. We have 300 engineers on the road now to whom we pay $3 a day apiece. They know how to handle steam, and if we put on electricity we may have to educate them all over again. With compressed air the handling is simple and not dangerous. Now there is an element we must take into account—the danger. A man climbs a pole to fix a wire. He professes to know all about electricity. He falls dead. He doesn't know as much as he thought he did."

It is almost needless to say that this is childish gabbling. The elevated roads will probably take no radical advance step so long as they remain under their present control. They may eventually do so as a subordinate branch of the business of their more enlightened and progressive competitor.

The Compressed Air Boom.

We have been, as we could not have failed to have been, believers in the adaptability and efficiency of compressed air for certain purposes of power storage and transmission. We have been glad to do what we could to spread information concerning it for the purposes for which it is eminently adapted. We have never believed and never represented that compressed air is the best means of power transmission in existence, or that it can ever supplant other means, except in the somewhat limited field which especially belongs to it. In shop use, with which we have most to do, it has shown its great value, especially for direct hoisting and for the driving of small portable tools, just as it had previously done in mining, tunneling and submarine work. The field of its usefulness has latterly broadened, until the number of its occupations is legion. A couple of street cars were run for a year upon one of the surface railway lines of this city and gave a most creditable exhibition. A fine power station and a full equipment of compressed-air cars for one of the cross-town lines of the city are now being prepared, and will soon, we hope, be in successful and permanent operation. The air-compressing plant will be much superior to that previously employed, and the motors also will exhibit the beneficial effects of the previously acquired experience, so that the present most strongly entrenched electric systems may not, after all, be the only means of surface traction.

But we are promised an exhibition of the powers of compressed air far more pretentious than this. It is proposing to arise in its might and drive practically all

the horses from our streets. The autotruck is to transform the city. We have a great boom on for compressed air. There is an American Air Power Company with a capital of $7,000,000, an International Air Power Company with a capital also of $7,000,000; a New York Autotruck Company, $10,000,000, and a Chicago Autotruck Company, $10,000,000. Such eminent engineers as Richard Croker and Joseph Leiter are operating the machinery, stock is selling, and its "value" is advancing. Some of it has been quoted above 70; but where is the truck, and what can it do? Where is the first truck, and where is there any promising record of its practical performance? There is a truck which has hauled castings around a factory yard in Worcester, Mass., and that, we are given to understand, is all that there is as yet to show. Two factories are ready to rush out the trucks, but are they yet invented? We are not here implying that they are not; but the question would seem to be a proper one. When stock is for sale the stock buyers should know what they are buying. Do they know in the present case?

Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer by mail.

(13) W. F. M., Limerick, Ireland, writes: I want to shrink some malleable cast iron ferrules 4¼″ long by ¼″ thick onto 9-16″ round steel rods 4 feet long. The ferrule has to go on half way (2 feet), and if not driven rapidly is liable to cool and stick fast on the bar. The usual mode is to drive on the ferrule by a falling weight. I am thinking of forcing them on by pneumatic pressure, by boring out the piston rod of air cylinder and fixing a suitable head to it to take the ferrule when the pressure would be applied as the ferrule is forced on; the steel rod would run into the piston rod made hollow for that purpose. Do you think this arrangement will be effective? Will the piston travel fast enough to prevent the ferrule sticking? With an 8-inch diameter cylinder what air pressure will I require to force the ferrule on? A.—You do not state how much allowance you make for shrinkage, and it is doubtful if anyone can tell just how much pressure would be required to force the sleeve on, even if he knew the shrinkage allowance. Our impression is that the air cylinder will act very quickly, but we think that no great force ought to be required to put this sleeve in place if it is properly done. In shrinking hoops and jackets in gun work no pressure is required, as they are expanded sufficiently to drop readily into place, and do not in fact touch the inner piece closely until after they are partially cooled. Our impression is that most, if not all, shrinking fits should be made in a similar way, that is, in this case we think the bore of the sleeve should not be more than .001″ or .0015″ larger in diameter than the shaft, and that when heated moderately, say up to the equivalent of about a blue heat for steel, the sleeve will go to its place without any force being required, and will, when cool, be held securely.

The additional revelations that have been made regarding Keely's alleged motor seem calculated to dispel any lingering doubt as to his character as a mere trickster and swindler, but nevertheless it is probable that many people will continue to think there is or was "something in it," and that if Keely had lived he would have made a success of it. And so he would have done if "success" be understood to mean in this case setting up sympathetic vibrations of such a nature as to loosen purse-strings and make people disregard the ordinary rules of common sense in making investments.

Specifications, Guarantees and Tests.

(*Continued from page* 115.)

test: "We want a test that we can with due care meet every time and never fail." This is all we, as buyers, can reasonably ask. We want a test that will compel him to exercise due care, and give us the best he can with such care, but we do not want him to lose any considerable portion of his product after exercising this care, and to secure the lowest possible price we must gage our tests within the manufacturer's possibilities. It is therefore important that the specification should be drawn up by one familiar with the methods of manufacture, as well as with the equirements of the service in question, or that the specification be submitted for criticism before adoption to a disinterested manufacturer of similar material.

Whenever it can be avoided, an article or a quality should not be specified that can only be produced by one or two makers, unless the price is fixed and unchangeable. Otherwise the buyer is at the mercy of the seller as regards price. In specifying tests of finished material when the nature of the test is such as to destroy the article, if the number destroyed is proportionately large, it will tend toward increasing the price; hence the number should be as few as will serve to represent fairly the general quality of the material.

When important material is bought under specification it is very essential that, in general, the tests prescribed and a careful inspection, at least occasionally, should be made, and that no material be accepted that does not fulfill the requirements. If this is not done the unreliable seller will soon discover the fact and the buyer will be handicapped. Prices, in general, will be based upon the quality specified; the unreliable seller will only very slightly shade the price that the quality specified can be produced for, and will then furnish a much inferior article, knowing it is not the custom to make a rigid examination.

It is, however, a fact that occasional tests, made at unstated intervals, will have a wholesome effect in maintaining the quality specified, and it is therefore not always necessary with unimportant material to make all tests prescribed on every lot purchased, but they should be made sufficiently frequent to give the assurance that the quality specified is to be maintained.

The conclusions arrived at are principally the following:

1. Specifications are mutually advantageous to the buyer and to the reliable seller in expediting business and avoiding misunderstandings.

2. For all important material it is essential for safety and economy to purchase under specification, and all details and tests prescribed should be insisted upon in order to maintain the standard of quality desired.

3. For unimportant material it is in general economy to purchase under specification, and all particulars specified should be required fulfilled, but with such articles occasional tests at unstated intervals, with thorough inspection, will generally be sufficient to maintain the quality.

4. The character of the specification and the nature of the tests prescribed should be adapted to insure the qualities requisite for the service in which the article is to be used, and qualities not essential should not be required.

5. The severity of the tests should be in accordance with the importance of the article in case of failure, viz.: More severe than actual service conditions on material in which a failure would be disastrous, but as light as the conditions will allow in other cases.

6. The manufacturer's methods and possibilities must be considered, and tests must only be prescribed that can be met with certainty when proper care is exercised, without unnecessarily increasing cost of manufacture.

7. Destroy as limited a quantity of finished material as is necessary to establish the quality.

8. A guarantee is an excellent supplement to a specification, but cannot in general forego the necessity of tests.

9. Specifications thus prepared should not increase the cost for any standard of quality, and the quality desired is assured.

We learn that the use for welding of such a transformer as has been shown and described in our columns by Mr. Geo. T. Hanchett is covered by patents, but believe our readers are at liberty to make and use the machine for any other purpose.

Special Notice to Advertisers.

Our front cover space is sold for 1899 and 1900, and we have on file applications for all of 1901 from four firms. Notice is hereby given that dates for 1901 will not be given by us until sometime in 1900, and then the original plan will be carried out—to give as many firms a chance at that space as possible. Please do not ask us to contract this page two years in advance—don't like to go so far into the future. Due notice will be given here when the reservation will be opened to settlement.

AMERICAN MACHINIST PRESS.

Inquiries for Machinery.

Those who make, or may know of the makers of such machinery as is called for below, will oblige us by sending name and address, mentioning the number of the inquiry. We cannot forward catalogs. We have inquiries as follows:

(92) Machines used in the manufacture of hominy.

(93) For makers of machinery used in the manufacture of mustard.

Obituary.

Nathaniel G. Gardner, who had been for thirty-three years superintendent of the J. B. & J. M. Cornell Iron Works, of New York, died in Westfield, N. J., January 25.

W. H. Conner, superintendent of the foundry department of the Edgar Thompson Steel Works, Braddock, Pa., died January 29; fifty-seven years old. Mr. Conner was born in Cumberland, Md., and went to Pittsburgh when eighteen years old and learned the molder's trade. He was superintendent of the foundry of Mackintosh, Hemphill & Co. for thirty years, resigning about six years ago to accept a position with the Carnegie company.

We have a copy of a Providence (R. I.) paper, in which it is stated that Mr. Gardner C. Sims, who was, it will be remembered, in charge of the machine work done on the repair ship "Vulcan" during the Spanish war, has been honorably discharged from the service, and that on May 28 last was promoted to the grade of Chief Engineer with relative rank of Lieutenant. Mr. Sims, we are informed, solved the difficulty arising from the fact that the Government pays a fixed price for machinists far below what they can usually command in private shops, by simply making up the difference out of his own pocket for the Providence mechanics employed on the ship.

Some time ago we spoke of what Mr. Henry A. House, of Bridgeport, Conn., had been doing in the way of developing high speed small vessels. These vessels were built at Cowes, Isle of Wight, England, and one of them was brought over to this country some time ago. Recently Mr. House has been giving his attention to the motor carriage problem and has adapted some of his devices relating to boilers and engines to this service with considerable success, he having equipped an ordinary express wagon with a boiler and a 15-horse-power engine, using kerosene as fuel, and with the whole outfit of added weight kept within 800 pounds. This work is now being carried on by Mr. House at Bridgeport, Conn.

We again call attention to the importance of always writing full address, including street and number, when communicating with us. Sometimes questions are asked which from their nature we think best not to answer in the paper. In such cases we usually desire to make some acknowledgment at least by mail, and are prevented from doing so where the address is given simply Chicago, Buffalo, New York, Cincinnati, etc., without number or street address. Letters addressed in that way to large cities always come back to us undelivered, unless addressed to prominent and well-known people.

The Self-Propelled Traffic Association, of Liverpool, England, has determined to hold another series of trials of motor vehicles for heavy traffic, probably in September, 1899. The previous tests held under the auspices of this association were conducted last year from May 24 to May 27. It is stated that in the forthcoming trials American competition will be welcomed, and those interested should address the secretary of the association, Mr. E. Shrapnell Smith, Royal Institution, Colquitt street, Liverpool.

On the occasion of the meeting of the American Paper & Pulp Association in this city February 15 and 16 a lecture illustrated by lantern slides will be given jointly by Mr. J. H. Patterson, president of the National Cash Register Company, and Dr. Tolman, secretary of the League for Social Service. This lecture will be given in one of the rooms of the Waldorf-Astoria Hotel and its title will be "What More Does the Employer owe to the Employee than Wages?"

Rigid fingers of wood or iron on shipper bars for shipping the belt from the loose to the tight pulley, or *vice versa*, especially if the shipping is frequent, soon injure the edges of the belt. Something that will turn freely, as, for instance, sleeves with ball bearings mounted on a rigid central pin, like the pedals on a bicycle crank, is a good device for the purpose—and somebody has actually recently obtained a patent on it.

The Bethlehem Iron Company has just turned out what is stated to be the largest steel shaft ever made in the world. It is for the Boston Elevated Road, and will be driven by an 8,000 horse-power engine. The shaft is 27 feet 10 inches long, diameter in center 37 inches, and diameter at ends 34 inches. Its total weight is 170,000 pounds.

In the article published in our issue of January 26 on the "Direct Utilization of Producer Gas in Europe," the waste gases from blast furnaces were meant by that term, which was erroneously chosen by the translator.

Commercial Review.

NEW YORK, SATURDAY EVENING, February 4, 1899.

ENGINES AND BOILERS.

The close of the first month of the year finds the demand for steam power plants in accord with the prosperous condition of general business. In a good many offices the sales for the month have been comparatively light, as is not unnatural at this season, but in others increased and extremely large volumes of orders have been booked. Almost everywhere a lively inquiry looking toward future work is reported, and the undertone of the market is strong and confident throughout. The demand for engines for electric lighting and railway purposes is holding its own, and the call from mills and factories is creditable to the improved state of the country's industries. Whether destined for lighting or power, almost every engine of good size sold in these days seems to be intended for driving a dynamo. Prices both of boilers and engines have an upward tendency. The radical advances in cost of plates and tubes, which have recently occurred, are bound to affect the figures on boilers, as most boiler sellers remark, but as yet few material changes have been made. In engines the raw materials are a less important item, as compared with the cost of manufacture, unless perhaps, where brass is largely employed. Prices of some makes of engines have, however, lately been advanced.

The engine contract which furnishes the most important current news item is one in connection with a line of industry lately much in evidence—cement manufacture. The Atlas Cement Company, Northampton, Pa., has ordered of McIntosh, Seymour & Co. sixteen horizontal tandem compound engines. Fourteen of these are of the gridiron valve type, of about 600 horse-power apiece, and the other two are of the high-speed center crank type, 250 horse-power each. All will be direct-connected, part to the line shafts and part to dynamos. Among other sales McIntosh, Seymour & Co. have just received an order from the Peninsula Electric Light & Power Company, Newport News, Va., for a 350 horse-power direct-connected engine. The two 600 horse-power engines purchased some

time ago for the tramways of Mexico City are now being shipped. The firm has on hand an unusually large volume of orders.

The Edward P. Allis Company has now in course of construction three large engines for the City of London Lighting Company. They will be used in connection with generators built by the British Westinghouse interests. Among business of the E. P. Allis Company in this district during the last month have been sales of three pumping engines and three big air compressors.

The Hooven, Owens & Rentschler Company has been meeting with much success in sales during the last few weeks. The following among others may be mentioned: An extra heavy 600 horse-power engine to the Lycoming Rubber Company, Williamsport, Pa., which is overwhelmed with orders for its goods and is greatly enlarging its facilities; a 500 horse-power cross-compound direct-connected condensing engine, and the high-pressure side of another one, for the New England Electric Railway Construction Company, to be used for a new suburban road at Worcester, Mass.; a 200 horse-power engine for a fur hat factory at Reading, Pa.; and a 150 horse-power engine for a town lighting plant at Canton, Pa. The Catawissa Fibre Company, Limited, Catawissa, Pa., has bought an 800 horse-power cross-compound condensing engine of the same make for a paper mill. The paper industry, it may be remembered, has for some time past been very active in the erection of plants.

The Fitchburg Steam Engine Company is about to ship to the International Paper Company two 250 horse-power engines. The American Sugar Refining Company, Jersey City, N. J., has lately ordered a 400 horse-power engine of the same make.

Another sale for a paper mill was of a 250 horse-power engine to the Oswego Falls Pulp & Paper Company, of Fulton, N. Y., by the Watertown Steam Engine Company. Since the first of the year the latter company has sold through its New York office alone, beside the above, 450 horse-power of engines for the White Star Line piers, 100 horse-power for the Wilson Line pier, 50 horse-power for the Excelsior brewery, two 100 horse-power engines for Siberia, and over 1,000 horse-power of boilers for various points.

For shipment to Siberia, the Ames Iron Works also have sold two 100 horse-power engines, with boilers.

In contracts lately let for the installation of an electric plant at the New York Navy Yard the engines comprise three 300 horse-power vertical cross-compound Erie Ball engines, for which the Frank M Pierce Engineering Company is the New York agent. Mr. Frank M. Pierce has just started for Cuba to inspect the engineering field, particularly from an electric lighting and street railway point of view.

An engineering firm having offices in New York is preparing for the installation of a lighting and power plant in Porto Rico, and for the transformation of a railroad there from steam to electric traction.

The Kalion Chemical Company, Philadelphia, Pa., has ordered of the Abendroth & Root Manufacturing Company a 250 horse-power boiler to carry a constant working steam pressure of 300 pounds per square inch.

The Stirling Boiler Company, Chicago, is said to have sold in January 20,000 horse-power of boilers. For the new ice plant that is being erected in this city by Jacob Ruppert interests 1,800 horse-power were ordered. The Norfolk Warehouse Company, Norfolk, Va., bought 250 horse-power.

FOREIGN ENGINEERING WORK.

J. G. White & Co., engineers, 29 Broadway, New York, it may be remembered, some little time ago received a contract for the installation of an electric railway at Perth, Australia. More recently they have taken one to install a 1,200 horse-power mining plant for the Deep Lead Transmission Company, near Melbourne. In the equipment, so far as at present ordered, will be two 400 kilowatt rotary field General Electric generators, and three 250 horse-power alternating current motors, each geared to a pump working against 400 feet head. The pumps will be made in England or Australia, the electrical machinery in America. The generators will be driven by two 600 horse-power cross-compound condensing Buckeye engines, 150 pounds steam pressure. Many Buckeye engines are in use in the region where the mines are situated, and partly because the principal machine shop to which they would have occasion to go for repair is familiar with them the Australian parties to the contract preferred that make. The condensers will be surface condensers furnished by the Wheeler Condenser & Engineering Company, and proportioned for circulating water of 90 degrees temperature. The air and circulating pumps will be independent Blake pumps with simplex valve gear.

There is prospect for some important railway and electrical work in Australia in which American manufacturers may take a hand. Representatives from Australia were here in the autumn to investigate American steam and electric railroading, including such departments of transportation as refrigerating and grain handling.

Mr. J. G. White has recently returned from a ten weeks' trip to Europe, his visit having chiefly been to England and France. He considers the field highly promising for electric railway and lighting enterprises.

Mr. John Roberts, municipal engineer of Durban, in South Africa, has just been visiting this country. He stopped at Niagara Falls and Buffalo to study high-tension electric transmission of power and gain information regarding rotary transformers. He also visited various steel works in Pennsylvania, and other manufactories. Further, he inspected the street railway systems of New York, Boston, Buffalo, Baltimore, and Philadelphia. He was greatly astonished that it is the practice in the United States for the various works to make a specialty of some one particular line of manufacture.

Mr. Roberts was furnished by Messrs. White & Co. with blueprints, catalogs, etc., showing American construction and practice in electrical work, attention being called to the rigid requirements as to governing under which American engine builders labor, and there is reason to expect that material for a new electric lighting and a new electric railway system in South Africa will be secured in the United States. It may be mentioned that Mr. Roberts was favorably surprised at the frequent American practice of using on street railways 9-inch girder rails instead of 6-inch, as is quite generally the case abroad.

The roof trusses for the car shed of the new tramway in Perth are being shipped in bales, so marked that each piece will be put in its proper place.

MISCELLANEOUS.

The Chambersburg Engineering Company has received from the Schoen Pressed Steel Company an order for twelve large riveting machines. As nearly as could be learned they are to have a gap of 100 inches.

The Department of State, at Washington, has received copies of reports upon British trade in South America, by Mr. Worthington, a special English commissioner for that purpose. Concerning Chilian trade in the district of Valparaiso, he says in part: "The railways in southern Chile almost all belong to the State, and the trade in rolling stock is chiefly by tender. Of late years, the United States has been most successful. Much, however, is done locally, as at present tenders for rolling stock from local makers are preferred, if not more than 15 per cent. higher than those from importers or than maximum prices fixed for the foreign article. . . . English steam engines for agricultural purposes hold the market. Some good gas engines come from Germany; they have not a preference over the English, but tend to keep the prices of the latter down. The market for mining machinery is, like the industry itself, in a very depressed condition. German mining machinery is reported better liked than English, and has also the advantage of there being more English [?] mine managers than there used to be, but English winding engines hold their own. . . . In agricultural

machinery, the United States seems to have gained the ascendency. The threshing machines for example, are reported lighter and quicker than English; and, although they do not separate so well, and will not last as long, they sell far more readily on account of their cheapness." In regard to the justice of some of the observations in the last instance there may be difference of opinion.

ENGINE TRADE ADDENDA—PROJECTED CONSOLIDATION, ETC.

Reports are current that the Corliss Steam Engine Works, Providence, R. I., have been bought out by Mr. Joseph H. Hoadley, representing a syndicate of capitalists, and that with the Corliss Steam Engine Company reorganized, and the American Wheelock Engine Company, and other important engine properties of the country, it is proposed to form a $25,000,000 consolidation. Mr. Hoadley was seen by a representative of the "American Machinist" and confirmed these reports. The acquisition of the Corliss works, he says, represents an investment of about $1,600,000. In another press interview, which Mr. Hoadley states to be in the main accurate, he is quoted as saying that out of twelve engine companies, whose membership in the combination would enable it to control the engine business of the country, eight have already practically agreed to join; that the remainder are not necessary to the success of the project, but that probably they will come in.

The Corliss engine works have just received an order for a 7,500 economical horse-power engine for the Boston Elevated Railroad. It will weigh about 500 tons.

The long-awaited transformation of the Manhattan elevated roads in New York to some system of power other than steam is in the wind afresh. According to reports active measures toward financiering the new enterprise are being undertaken, and the decision whether electricity or compressed air shall be adopted has been left to one capitalist. "Since I have spent about three months of every year for the past five years looking for the Manhattan's forthcoming contract," remarks a boiler agent, "I shall not be surprised if I have to wait a little longer yet."

CHICAGO MACHINERY MARKET.

The best evidence of the machinists' supply trade is the condition of the machine shop business. A year or two ago the customer who wanted some small work done promptly could go to almost any shop in the city with the job in the morning and receive back the finished material or the repaired machine the same day or the day following. Now when he wants a similar job performed he visits all the machine shops and is fortunate if he obtains a promise to have the work completed in a week. The shops have all the work they can do. They are turning it away. This happens daily at Chicago in a large number of instances.

Nor is the situation much, if any, different throughout the West. At Racine, Wis., upon the authority of a supply man who visits that little city regularly once a month, there are now about twenty manufacturers who are making additions to their plants. This calls for more shafting, more belting, more pulleys and hangers, more tools, more emery wheels, more everything that is used about a shop, and the supply men are busy. Throughout Iowa there is fresh activity. The border towns on the Mississippi are reveling in a new-found, or a more capacious, prosperity. The copper region in the Michigan peninsula is fervidly keen for the supply man's goods. Illinois and Wisconsin and neighboring States are consuming more generously of this kind of provender.

A better tone exists in reference to prices. Dealers of small tools report that makers are withdrawing former quotations very commonly now. Within the past two weeks, or since the opening of the present month, advices have been received from a number of Eastern manufacturers, announcing a 10 per cent. advance in prices. There is as yet no general advance, but inclinations that way have been more pronounced this month than at any time since trade began to improve. On some grades of emery wheels there is no improvement, but the better wheels are said to be very firmly held.

Speaking of shop supplies generally, trade in January was less active than in the preceding several months, but it compares very favorably with January, 1898. For belting it is the dull season of the year, yet the Chicago Belting Company is two months behind in its orders, and another company we have heard from is working nights on some quick delivery contracts. From the lumber mills and the cotton seed oil plants in the South there is a good trade for belting, and from the Northwest a decided improvement is looked for with the coming of early spring.

The trade of the Chicago office of a well-known pulley company increased 35 per cent. in January over the trade of the same month last year. Its works are running at their full speed.

Quotations.

NEW YORK, Monday, Feb. 6.

Iron—American pig, tidewater delivery:

No. 1 foundry, Northern	$12 25 @ 12 75
No. 2 foundry, Northern	11 75 @ 12 25
No. 2 plain, Northern	11 25 @ 12 00
No. 1 foundry, Southern	12 75 @ 13 25
No. 2 foundry, Southern	12 50 @ 13 00
No. 3 foundry, Southern	12 00 @ 12 50
No. 1 soft, Southern	12 75 @ 13 00
No. 2 soft, Southern	12 50 @ 12 75
Foundry forge, Southern	11 75 @ 12 25

Bar Iron—Base—Mill price, in carloads, on dock: Common, 1.18 @ 1.20c.; refined, 1.23 @ 1.30c. Store prices: Common, 1.35 @ 1.40c.; refined, 1.40 @ 1.50c.

Tool Steel—Base Sizes—Standard quality,

(Quotations continued on page 41.)

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting, Grant; see p. 18.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer.Mach.T.Co.,Meriden,Ct.

For Sale, Cheap—Chest pattern or cabinet-maker's tools. Box 91, AMER. MACHINIST.

The Dutton Wet Twist Drill-Grinder is sold by the Garvin Machine Co., New York City.

Shafting straightener; state make, condition, capacity, price. Box 59, AMER. MACH.

Traveling salesman wants agency in England for machine tools. Box 85, AM. MACH.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark,N.J.

Book "Dies and Diemaking," price $1, post paid. J.L.Lucas,Prov.,R.I. Send for index sheet.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

American Machinists, 1880 to 1899, for sale, unbound, except 1880, which is in leather binding; will sell for $25. Address Box 72, AMERICAN MACHINIST.

Threads and gears; easy rules to cut any thread possible to be cut in the lathe, without algebra, sent to any address for 25c. by G. W. Dixon, Spring Lake, Mich.

Accurate work our specialty; all kinds of light machinery made to order; send for samples of punch and die work. Waltham Machine Works, Waltham, Mass.

Institutions retiring from business having machine tools, brass or wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

For Sale or Rent—Foundry and machine shop with additional land, in good condition and well equipped for medium heavy work; capacity of foundry 7 tons per day; located on railroad within eight miles of New York; terms easy. Call or address J. F. Sweasy, 26 Nassau street, New York.

Wants.

Situations and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisement under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Blacksmith, first-class tool dresser, desires change. Box 79, AMERICAN MACHINIST.

First-class mechanical draftsman wants position. Box 71, AMERICAN MACHINIST.

Experienced designer of engines and general machinery seeks position. Box 61, AM. MACH.

Draftsman; expert engine, general machine works; New York or vicinity. Box 88, AMERICAN MACHINIST.

Foundry foreman wishes position; experienced, heavy or medium castings. Box 73, AMERICAN MACHINIST.

Machinist desires position as draftsman or assistant draftsman. W. L. S., 114 S. Sherman st., Wilkes-Barre, Pa.

Foundry foreman wishes position; experienced in both light and medium castings. Box 54, AMERICAN MACHINIST.

Mech. engr., first-class draftsman, 12 years' exp. in steam engineering and mining mach., open for pos.; best refs. Box 66, AM. MACH.

First-class draftsman, tech. graduate, experienced in machine and mill construction, desires position. Box 84, AMER. MACHINIST.

Man experienced in reducing shop expenses by mechanical means, wishes to correspond with parties requiring such service. Box 87, AMERICAN MACHINIST.

Wanted—Position as superintendent in manufacturing plant; well up in modern shop practices; presses and dies a specialty. Address Box 86, AMERICAN MACHINIST.

Wanted—Position as foreman; had experi-

ence on general machinery, dynamos, tools; can design tools for interchangeable work. Address P. O. Box 304, Derby, Conn.

Position as salesman or draftsman wanted by a technical graduate, exp. in the design of hydraulic machinery, valves and tools and general machinery. Box 82, AMER. MACH.

Wanted—A position to take charge of a factory, by a man thoroughly experienced in safety-pin and brass novelty business; best of refs. Address Box 90, AMERICAN MACHINIST.

Wanted—Position by foreman pattern maker, with first-class experience in steam, gas engine and gen. work; thorough, practical and reliable. Address Box 81, AM. MACH.

A practical and up-to-date mechanic, with 30 years' experience in the manufacture and sale of air-compressing and hydraulic machinery and tools, desires position with responsible concern. Box 55, AMERICAN MACHINIST.

As foreman or supt., American, 37 years of age; good education; 20 years' experience in the economical production of guns, watches, typewriters and automatic machinery; references first class as to character and ability. Box 74, AMERICAN MACHINIST.

Supt. desires change; present position 6½ years; familiar with piece-work system of factory 400 to 500 hands, manufacturing articles with great amount of detail; designed tools 5½ years; salary moderate; a thorough disciplinarian. Box 75, AMER. MACHINIST.

Experienced mechanic, good draftsman, of 16 years' practice at designing and building machine tools, special and auto. machinery, jigs, tools, etc., used in up-to-date manufacturing, successful in handling men, would like position with manufacturing concern or machine shop. Box 80, AMERICAN MACHINIST.

Help Wanted.

Wanted—A good machinist, an all-round man for general job work. Address Box 50, AMERICAN MACHINIST.

The CROSS OIL FILTER

actually reduces oil bills 50% or more. Sent on approval. Capacities 3 to 120 gals. per day. Used in 21 countries. Testimonials from the leading firms in every field of industry.

THE BURT MFG. CO.
AKRON, OHIO, U. S. A.

Business Established 9 Years.

Largest Manufacturers of Oil Filters in the World.

You Will Need This Lathe

to make a good profit on your work. Hollow Spindle, Drill Chuck Centers, Belt, Turning Tools, complete.

Our Special Offer, $20.00.

Screw Cutting Lathes 10 in., $75.00 up.

The Frasse Co.
17 Warren Street, New York,
Near Broadway.

YOU SHOULD EARN MORE

If you will devote some of your spare time at home to study, we will help you to a better position and higher pay. Cost so low that you will not feel the outlay. Thorough and Practical Courses by mail in

Mechanical, Steam and Electrical Engineering, Mechanical Drawing and Machine Design. Best Text Books and Drawing Plates Free.

Seven years of experience in teaching by correspondence have made our courses the best, most thorough and practical. Write for illustrated Circular T, sample pages of text books, drawing plate and booklet of letters from students all over the world.

The United Correspondence Schools,
156 FIFTH AVENUE, NEW YORK.

Wanted—Draftsman and designer on dies and presses for sheet-metal work. Box 78, AMERICAN MACHINIST.

Mechanical draftsman wanted; one who is acquainted with wood-working machinery preferred. Apply at once to C. W. Rollins, Birnamwood, Wis.

Wanted—Good, bright and quick men on molding machines; permanent job if satisfactory; state experience, age and wages expected. Box 64, AMERICAN MACHINIST.

Wanted—Experienced lathe hand to take charge dozen lathes; quick young American handling apprentices preferred; state salary, experience, reference. Box 76, AMER. MACH.

Wanted—Four vise hands and fitters on first-class machine-tool work; none but first-class workmen need apply. Address, giving experience, references, etc., Box 67, AMERICAN MACHINIST.

Wanted—Foreman for blacksmith shop running five fires, furnace and steam hammer; state wages desired and give references. Address The F. M. Davis Iron Works Co., Denver, Col.

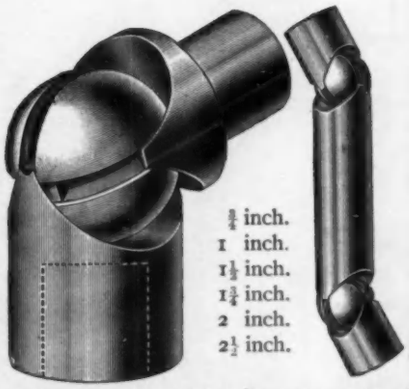
Wanted—A machine blacksmith familiar with tempering, hardening, etc.; one experienced in die work preferred. Address, with full particulars and wages desired, Box 83, AMERICAN MACHINIST.

Wanted—Experienced machinery man with $25,000 to invest in an established machine shop now manufacturing the most successful gas engine on the market. Address Box 77, AMERICAN MACHINIST.

Wanted—Experienced operator on Jones & Lamson flat turret lathe, also seven or eight first-class machinists; we can use nothing but first-class men; none others need apply.
Fitchburg Machine Works, Fitchburg, Mass.

Two (2) assistant foremen; one especially experienced in small lathe work; other on plain milling machine work as used in construction of engine lathes, screw machines and shapers; to first-class men who are good handlers of help, steady positions and good wages are assured; write fully, stating exp. and wages required. Box 89, AMER. MACH.

J. M. ALLEN, President.
WM. B. FRANKLIN, Vice-President.
F. B. ALLEN, Second Vice-President.
J. B. PIERCE, Secretary and Treasurer.
L. B. BRAINERD, Assistant Treasurer.
L. F. MIDDLEBROOK, Assistant Secretary.



These Universal Joints are made of steel, with hardened ball, for transmission of power at angles. Made with special lengths of stem to order. Invaluable for special machinery and tools.

Address:

Vanderbeck Tool Works, Hartford, Conn.

(Quotations continued from page 40.)

6 @ 7c., with lower prices on some brands; extra grades, 11 @ 12c.; special grades, 16c. and upward.

Machinery Steel—Ordinary brands, from store, in small lots, 1.50 @ 1.60c.

Cold Rolled Steel Shafting—Base, sizes, from store in small lots, 2.15c. upward.

Copper—Carload lots, Lake Superior ingot, 18c.; electrolytic, 17¾c.; casting copper, 17½c.

Pig Lead—Carload lots, 4.65 @ 4.70c., f. o. b. New York.

Pig Tin—For 5 and 10 ton lots, 24¾ @ 25c., f. o. b. New York.

Spelter—In carload lots, 5.95 @ 6c., New York delivery.

Antimony—In cask lots and over, Cookson's, 10¼ @ 10½c., according to quantity; other brands generally 9½ @ 9¾c. These prices may perhaps be shaded.

Lard Oil—Prime city, present make, the leading brand, 46 @ 48c., in wholesale lots.

Manufacturers.

Ed F. Anderson has lumber ready for the erection of a machine shop at Ettrick, Wis.

The Wilmington (Del.) Malleable Iron Company is to build an addition to its plant.

Additions are being built by R. S. Newbold & Son to their Norristown foundry and machine shop, Pa.

John Engel will build a one-story brick workshop, 40 by 90 feet, at 3042-44 Boudinot street, Philadelphia.

John Hill, a resident of Lowell, Mass., it is said, will be one of a company to build a new cotton mill in Atlanta, Ga.

The Hamilton (Ont.) Blast Furnace Company has decided to install a steel plant in connection with the blast furnace.

The New Castle (Pa.) Shovel Works have purchased ten acres of land for $10,500 on which they will erect a factory. The main building will be 300x80 feet.

W. S. Preston, Grinnell, Ia., has put up a building to be used as a foundry. As there is no foundry near there, he will no doubt make a profitable venture of it.

Architects Fisher Brothers, of Pontiac, Mich., have completed plans for a factory for the Pontiac Wheel Company, and are now ready to receive proposals for its erection.

Mr. E. D. Johnston, president of the P. H. & F. M. Roots Blower Company, has received the contract of a New Orleans irrigation pumping plant amounting to nearly $100,000.

Work began at Iola, Kan., recently on the erection of a Portland cement factory. The new factory is backed by Michigan parties who are now engaged in that business at Coldwater.

Charles J. O'Hara and others, of Worcester, Mass., with W. B. Eastman, of Cumberland Mills, Me., have organized the Wachusett Thread Company, under Maine laws, with a capital of $50,000.

The Berlin Iron Bridge Company, of East Berlin, Conn., has just shipped material to the Hawaiian Islands, to be used in the construction of what is believed to be the first American bridge erected in those islands.

The Cole Manufacturing Company has purchased 3½ acres of ground on Western avenue, Chicago, Ill., and will at once begin the erection of a factory building of mill construction, covering 30,000 square feet of ground.

The Manhattan Oil Motor Company has purchased a factory near Pacific Avenue Station, Jersey City, on the main line of the Central Railroad of New Jersey, and will get in shape at once to install machinery used in the manufacture of the motors.

The plant of the J. M. Jones car manufactory in Port Schuyler, N. Y., will be enlarged in the spring. The addition will be erected on the ground formerly known as Circle

(Continued from page 41.)

street. The move is made necessary by the increase in the business of the firm.

The Weber Gas and Gasoline Engine Company, Kansas City, Mo., has planned to build new and extensive shops next spring. G. J. Weber, president of the company, said that plans were made for a foundry, one story high and machine shops, two stories.

The Griffin Wheel Works has secured a building permit for the erection of a one and two story factory at 168 to 196 Sacramento street, Chicago, Ill. The building will be of brick, and its greatest dimensions are 320x 172 feet. The cost of the structure will be $24,000.

Work will begin soon on the new building to be erected for the Peoria (Ill.) Cordage Company. The new structure will be 165x88 feet and three stories high, and will probably cost $20,000. This new building will be equipped throughout, and an increased force will be put on.

Baker Bros., Toledo, Ohio, have decided to enlarge their foundry plant. The buildings will be enlarged to twice their present size in order to accommodate the rapidly increasing business. The improvement will furnish employment to 300 men and will cost, it is estimated, $12,000.

W. J. Quinlan, of the firm of Chambers, Bering & Quinlan, Decatur, Ill., whose factory was damaged to the extent of $35,000 recently, states that the company will rebuild their plant as soon as possible. The building which was destroyed was 225x50 feet in dimensions and was a two-story structure.

The McCormick Harvesting Machine Company will begin at once the construction of a building to be used as a blacksmith shop at Blue Island and Western avenues, Chicago, Ill. The ground area of the building will be 55x145 feet. The material of construction will be brick.

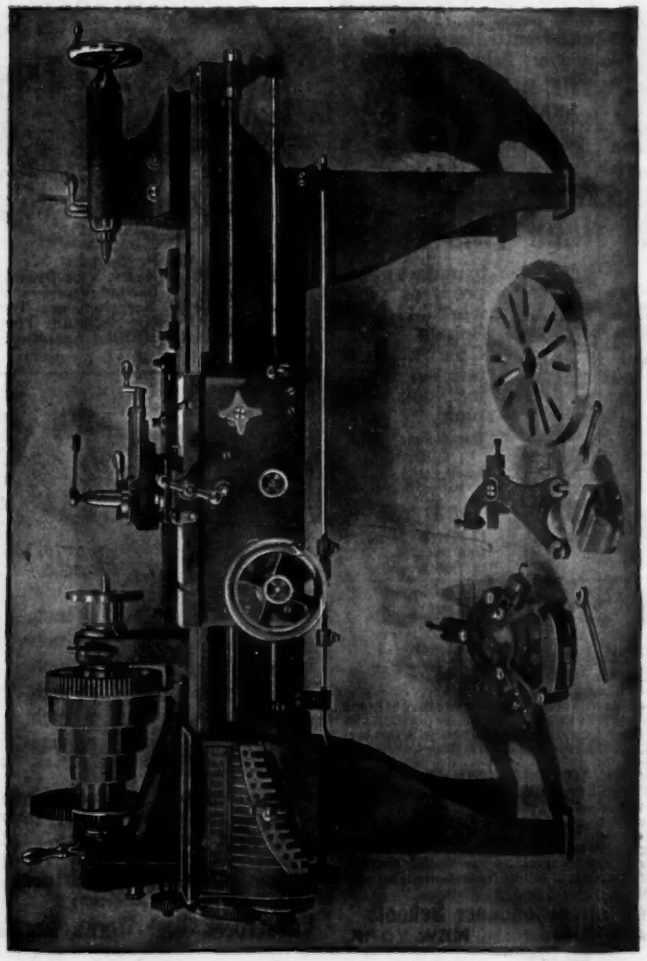
There is much good feeling in Beloit over the announcement that Fairbanks, Morse & Co., Beloit, Wis., are to rebuild their tank manufacturing department, which was burned last summer, and are also to make considerable enlargements to their plant. The Fairbanks, Morse plant now employs 600 men, and the additional buildings to be put up this season will furnish accommodations for 300 more men.

The firm of Joesting & Schilling, St. Paul, Minn., has in view the immediate enlargement of its business in a material way. At a recent meeting of the Assembly the firm secured the passage of an ordinance granting it a lease of twenty-five years of a part of the west side levee directly east of the Waterous Engine Works. Here the firm proposes to erect a factory building 50 feet wide and 100 long.

Extensive improvements, work on which will begin soon, are to be made at the plant of the Shenango Machine Company on North Water street, Sharon, Pa. A steel addition will be erected, replacing a greater portion of the present structure, and a 20-ton traveling crane and other improved machinery added to the equipment, which will about double the capacity of the plant. New machinery will also be placed in the machine shop.

The directors of the Westinghouse Machine Company, of East Pittsburgh, Pa., have called a special meeting of the stockholders for March 1 next, to vote upon an increase in the capital stock, in order to make extensive improvements and additions to equipment. The capital stock of the Westinghouse Machine Company is $1,500,000, and this will probably be doubled to meet the cost of the extensions and to prepare for the expansion of business. The main machine shop at East Pittsburgh is 600 feet long and 250 feet wide. This will be extended both ways.

16 IN. x 6 FT. HENDEY-NORTON LATHE.



THE HENDEY-NORTON ENGINE LATHE is the most modern type of engine lathe extant. Why? Because it has the best improved attachments known for the rapid and accurate production of high-class lathe work in use on engine lathes at the present time.

One is the Norton arrangement of change gears for screw cutting. All the change gears are mounted in the gear box ready for use. The different pitches are obtained by the simple movement of handle in gear box from one notch to the other, carrying with it an intermediate gear meshing into the cone of change gears. Thus every thread required in ordinary use is obtained on the instant, and this applies equally well to the feeds.

Another is the reversing lever at side of apron. At the moment of changing travel of carriage, as when cutting threads, you have but to move up or down this lever when the *carriage*—not the countershaft, belt, head spindle and work—returns in the opposite direction, and so on till work is finished. This saves wear and tear on working parts.

In this specimen of thread cutting we have a good illustration of the application of the above features; but it is here shown to illustrate in particular what our Automatic Stop will do. It shows how threads can be cut to and from shoulders, both internally and externally, tool stopping to a certainty, and with work in motion. This feature is equally applicable in turning work in duplicate. The Automatic Stop is at once positive and simple.

AGENTS FOR THE PACIFIC COAST:
Pacific Tool & Supply Co., San Francisco, Cal.

J. W. Cregar, Philadelphia Bourse Exhibition.

EUROPEAN AGENTS:
Schuchardt & Schutte, Berlin, Vienna, Brussels.
Chas. Churchill & Co., Ltd., London and Birmingham, Eng.
Adolphe Janssens, Paris, France.

THE HENDEY MACHINE CO.,
TORRINGTON, CONN.